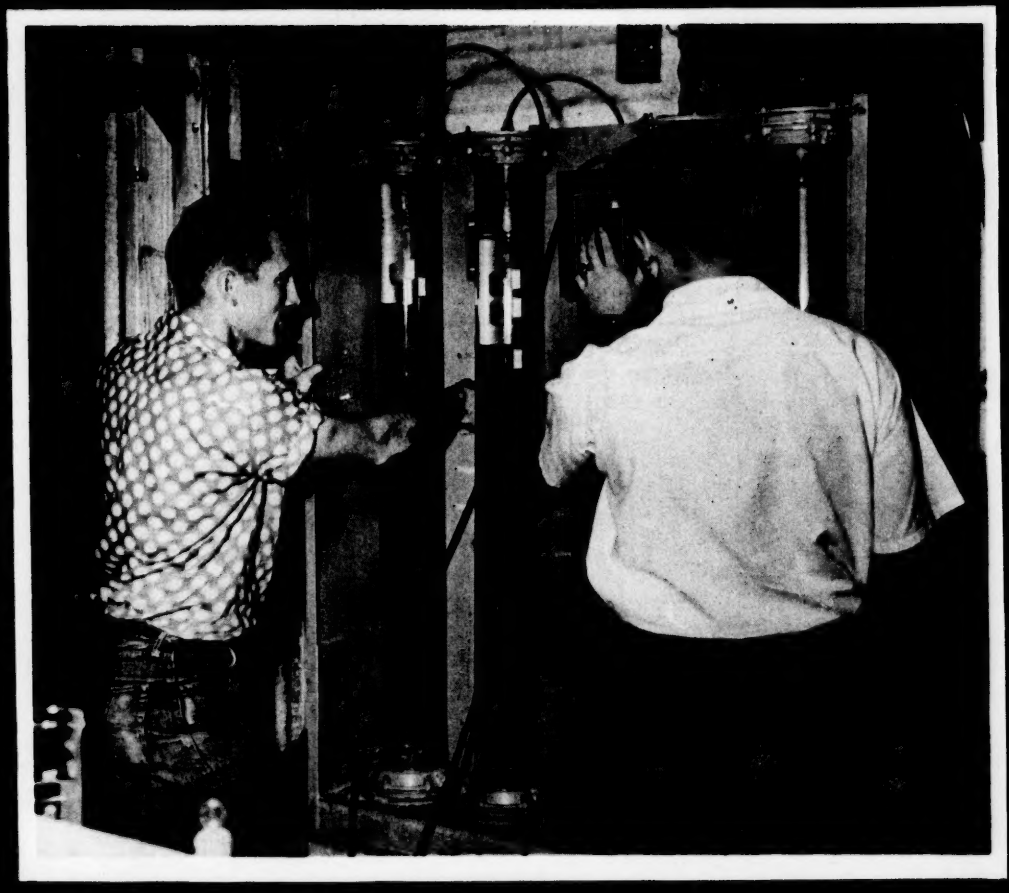
ICE and REFRIGERATION

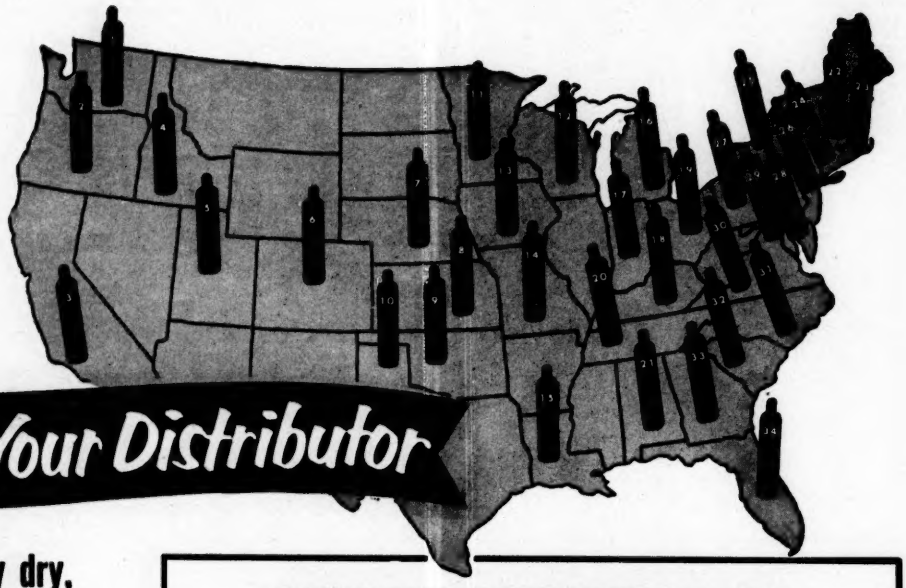
THE NA
INDUSTR



Conversion of Multi-Story Warehouses .... Page 17

AUGUST • 1953

Annual Survey Shows Volume of Ice Sold in 1952 .... Page 25



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99.99% AMMONIA

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4. IDAHO
Boise ..... Van Waters & Rogers, Inc.

5. UTAH
Salt Lake City ..... Louis A. Roser Co.

6. COLORADO
Denver ..... The Chemical Sales Co.

7. NEBRASKA
Omaha ..... Kennedy & Parsons Co.

8. KANSAS
Wichita ..... Barada & Page, Inc.

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Oklahoma City ..... Barada & Page, Inc.
Tulsa ..... Barada & Page, Inc.

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San Antonio ..... Westbrook Co.

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12. WISCONSIN
Milwaukee ..... Reichel-Korfmann Co.

13. IOWA
Cedar Rapids ..... Cherry-Burrell Corp.
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Detroit ..... Davis Supply Co.
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17. INDIANA
Indianapolis .... Wm. Lynn Chemical Co., Inc.

18. KENTUCKY
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Cincinnati ..... John H. Schafer, Inc.
Cleveland .. The Cleveland Brewers Supply Co.

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Nashville ..... John Bouchard & Sons Co.

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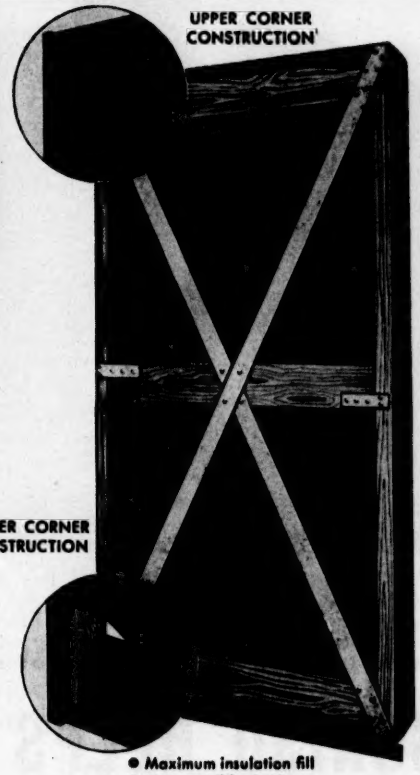
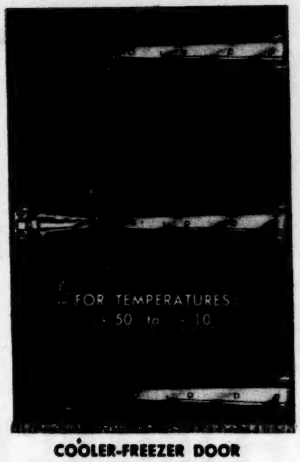
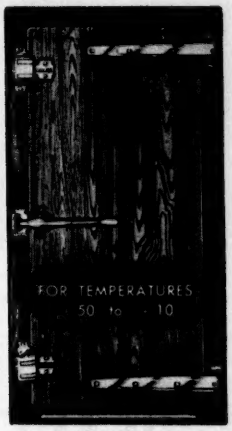


UPPER CORNER CONSTRUCTION

LOWER CORNER CONSTRUCTION

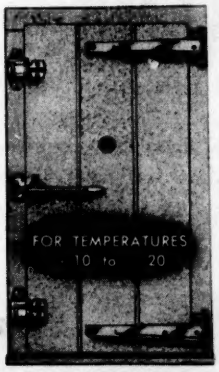


COOLER-FREEZER DOOR
- Modern streamlined job
- 100% "Douglas Fir"
- Sanitary hardware



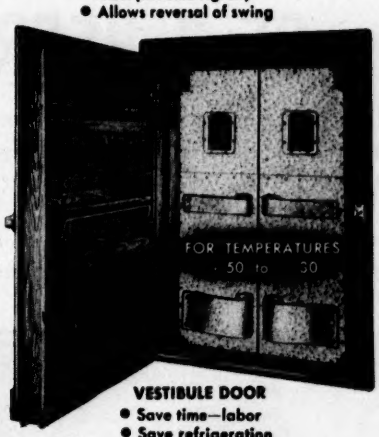
X-52 PLYWOOD PANEL DOOR
- Plywood front and back
- Extra heavy-duty hardware
- Special type gaskets

- Maximum insulation fill
- Most possible rigidity
- Allows reversal of swing



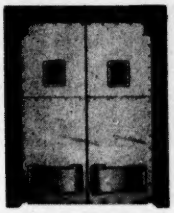
LOW TEMPERATURE DOOR
- Entire metal-clad front
- Extra heavy-duty hardware
- Special type gaskets

SUPER FREEZER (OVER-LAP) DOOR
- Extra-heavy construction
- Extra-heavy duty gaskets
- Extra heavy-duty hardware

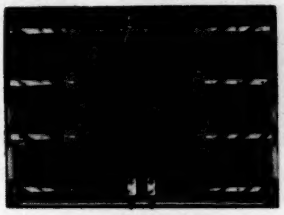


VESTIBULE DOOR
- Save time—labor
- Save refrigeration
- Large plant operation

TRACK DOOR
- For abattoirs
- Meat handling rails
- Banana rooms



AUTO-CLOSE DOOR
- For loading dock
- Intra-cooler doors
- Heavy trucking



DOUBLE DOOR
- For palletizing
- For carloading
- For elevator shafts

BUTCHER BOY REFRIGERATOR DOOR CO. • HARVARD, ILL.

SLUDGE AND WAX ELIMINATED. A firm engaged in constructing and servicing industrial refrigeration equipment had constant trouble with compressor oils. Every oil tried lost viscosity excessively under high operating temperatures, vaporized and formed sludge, or formed wax at low temperatures. Complaints were numerous and time lost on call-backs was costly. After consulting compressor manufacturers, the company switched to Suniso. This "Job Proved" refrigeration oil immediately solved all sludge, wax and low temperature problems for this organization.

SUNISO HELPS INCREASE EFFICIENCY OF 3 REFRIGERATION SYSTEMS

Here are typical examples of how Suniso Refrigeration Oils are helping increase compressor efficiency and are keeping refrigeration system maintenance to a minimum. Following the lead of original equipment manufacturers, more and more maintenance men and refrigeration engineers are safeguarding the efficiency and reliability of their compressors with Suniso.

Suniso Refrigeration Oils meet the requirements of *all* compressors and *all* refrigerants. To get more information, write SUN OIL COMPANY, Phila. 3, Pa., Dept. IR-8

COMPRESSORS FREE OF SLUDGE AND CARBON at this large ice cream plant. The oil previously used formed carbon and sludge, the system required special filter handles, and special filtering equipment. Since the change to Suniso, four years ago, operation has been excellent: filters turn freely, oil consumption is down 66%, maintenance 33%.

SEPARATION TROUBLE ENDED. In this 15-ton ammonia compressor, the oil discolored badly and failed to separate properly from the refrigerant. Excessive amounts of oil carried over into the separators, lowering the efficiency of the entire system. With a switch to Suniso, separation, carryover and discoloration problems ended.

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ICE and Refrigeration

VOLUME 125 NUMBER 2

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August, 1953

CONTENTS

Cover: Operating Ion Exchange Process

Feature Articles

Conversion and Modernization of Multiple Story Refrigerated Warehouse 17
Effect of Cold Storing Peanuts on Processing 22

The Ice Industry

33,738,383 Tons of Ice Sold in 1952 25
Vacuum Cooling Process for Lettuce Provides Better and Faster Service 27
Another Use for Ice — Two-Page Color Spread Tells How to Glamorize Summer Parties 28
Air Induction Offers Cooling System for Trucks Using Ice 30
Ion-Exchange Process to Manufacture Clean Ice 31

Practical Refrigerating Engineer

Refrigeration on the Rails 33
News Notes and Chapter Activities 36
NAPRE Question Box 38
Motor Enemies Make Triple Trouble 40

Refrigerated Warehousing

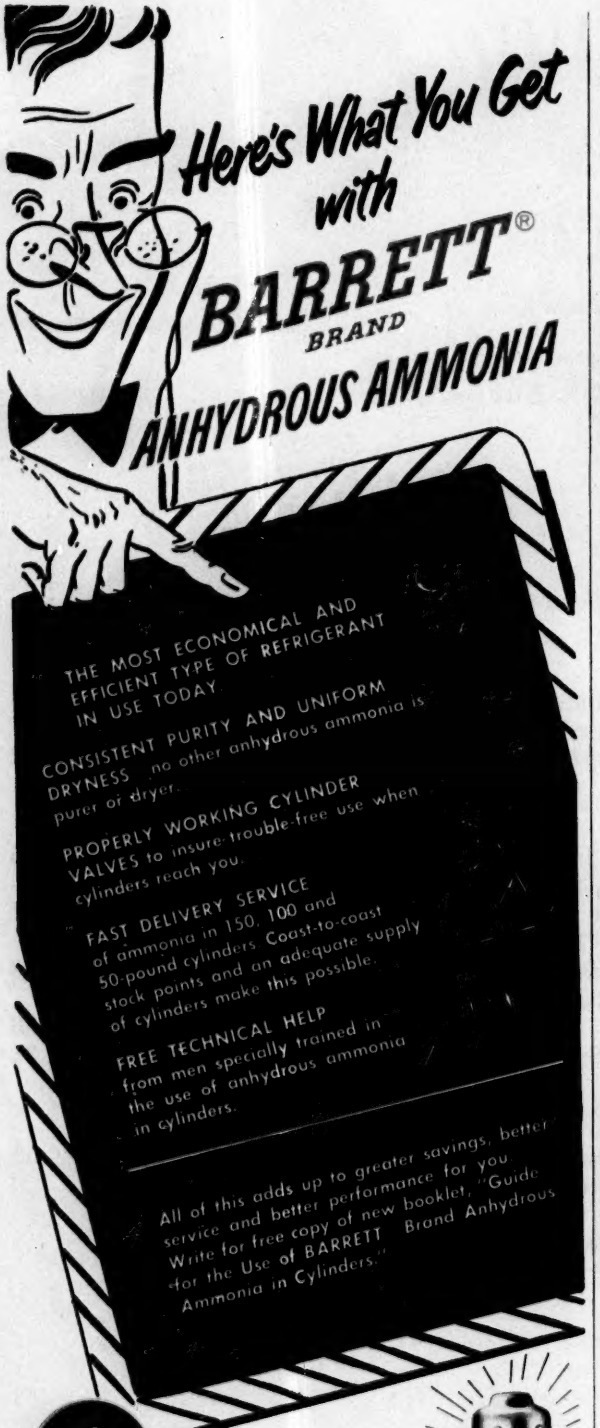
Cold Storage Holdings 41
The Storage and Handling of Peaches 44
Port of Seattle Adds New Fish Storage 45

Mid Year ASRE Meet Draws Record Attendance 47
Shipments of Air Conditioning and Commercial Refrigerating Equipment 51

Departments

Convention Calendar 54
Association Directory 54
New Plants 55
What's New in Equipment 56
Manufacturers' News 60
Catalogs and Bulletins 64

BUYERS GUIDE 65 **ADVERTISER'S INDEX 72**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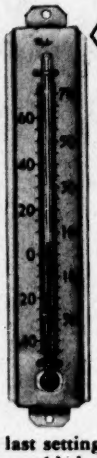
ON THE WALL



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Price: $7.50.

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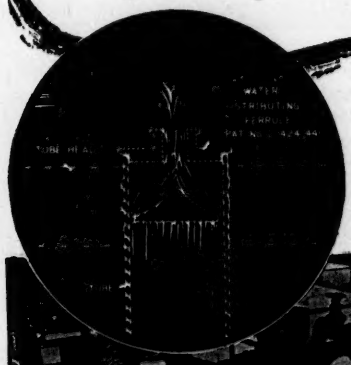
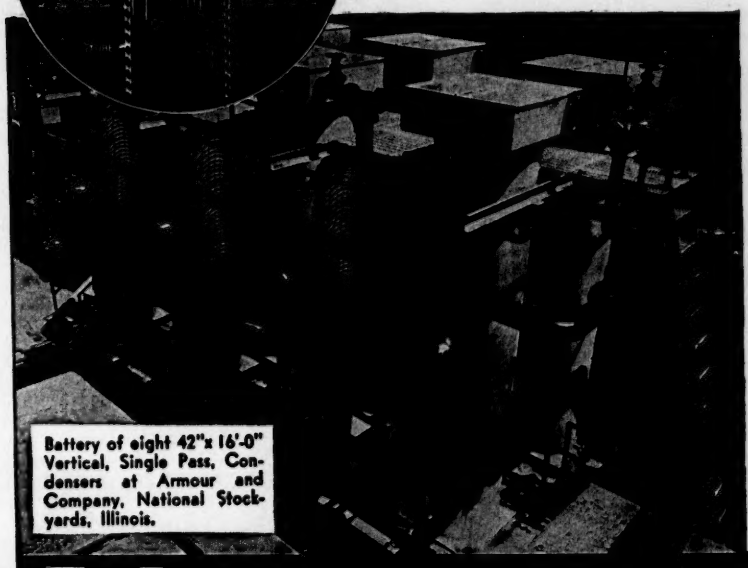
(Closed Type)
Water circulated in tubes traverses the length of the unit a number of times as determined by baffles in the heads.

375 tons capacity Multipass Condenser installation at Railways Ice Co., Belen, New Mexico.

Vertical Single Pass Condensers
(Film Type)
Patented ferrules give equal distribution of water to and over the surfaces of all tubes in a unit.





Battery of eight 42"x 16'-0" Vertical, Single Pass, Condensers at Armour and Company, National Stockyards, Illinois.

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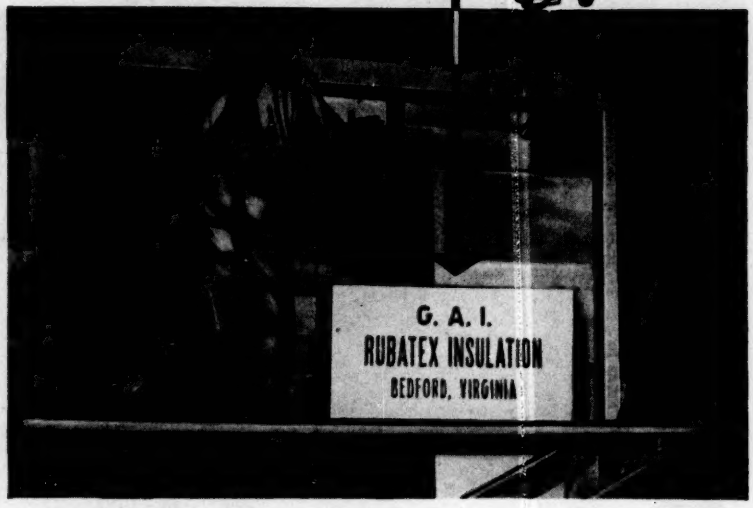
3 big reasons why Hormel Freezer Plant insulated with Rubatex Insulation Hardboard

1. ***Reduces Operating Costs***
2. ***Prevents Condensation Damage to Machinery and Food***
3. ***Assures Low Temperature Control***



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FOR BETTER REFRIGERATING PERFORMANCE!

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Unique closed cellular structure shuts out moisture — resists deterioration — prevents condensation damage to machinery and food.

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Its thermal conductivity coefficient "k" is only 0.21 B. t. u. per hour, per degree Fahrenheit temperature difference, per square foot of area, per inch thickness. This low "k" factor remains constant.

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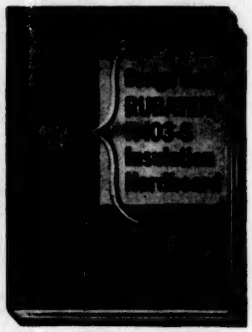
Independent laboratory tests of Rubatex Insulation Hardboard vs other insulating material showed that Rubatex required only 53% as much power to maintain the required low temperature.



Send for Design Data Bulletin RBH-1-50, Dept. IR-8, Great American Industries, Inc., Rubatex Division, Bedford, Va.

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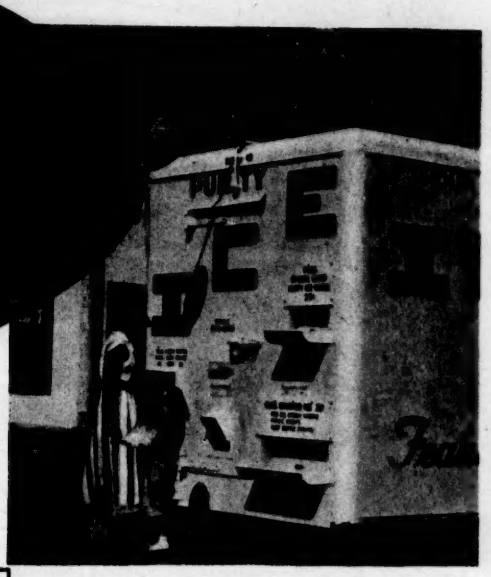
George W. Heath
Manager, Ice Division
Oscar Mayer & Company
Madison, Wisconsin



George W. Heath tells you how Oscar Mayer & Company buys its Ice Bags: "First and foremost, we want maximum wet-strength protection. Effective closures are important. Wire for the large bags, tin ties for the smaller ones. We require good printing, top service and competitive pricing. We have purchased all of our Ice Bags from Union for as long as we have sold ice in paper bags."

FAMILIES who have access to automatic vending machines buy processed ice early in the morning, late at night, right around the clock.

VENDING machines are an answer to increased labor and delivery costs. People can get ice in convenient, clean wet strength paper bags where they want it, when they want it, and as they want it.

OPERATORS have found that buyers will stop at vending machines and pick up ice where they would not bother to call and wait for it to be delivered. Units which are properly located and maintained have advertising value that creates immediate impulse sales.

IN ADDITION to block ice, vending machines create heavy traffic for small bags of ice cubes and crushed ice. Proper bags are important. Good-looking, dependable wet-strength Union bags are one of the best merchandising aids you can have.

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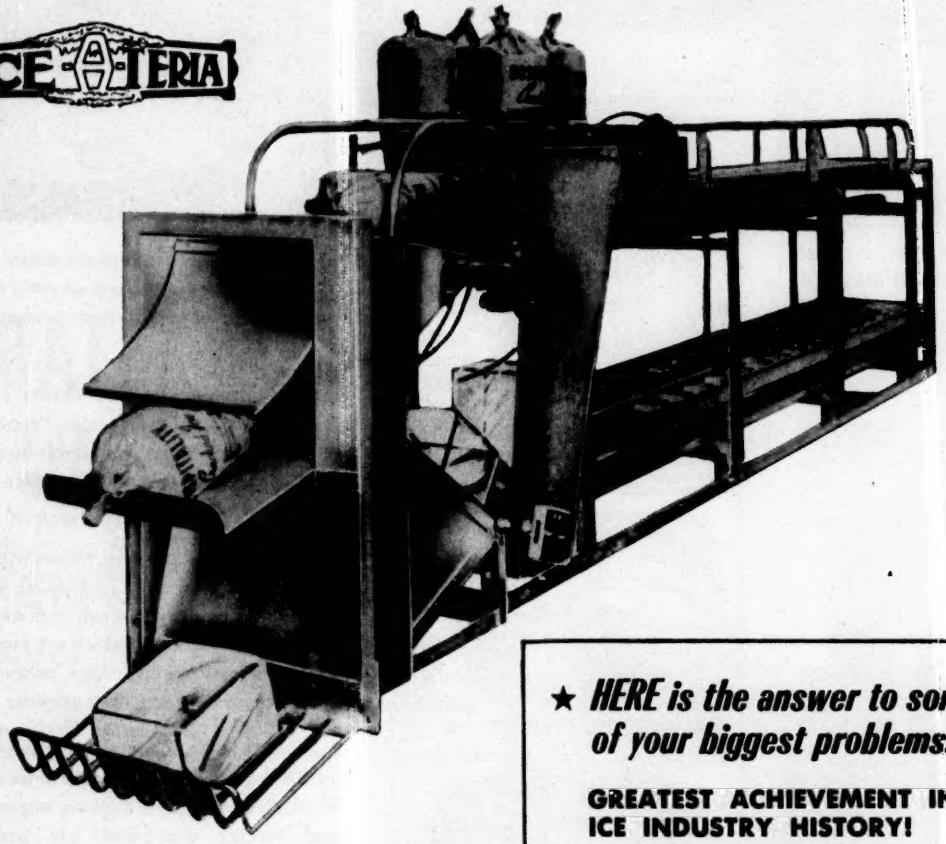

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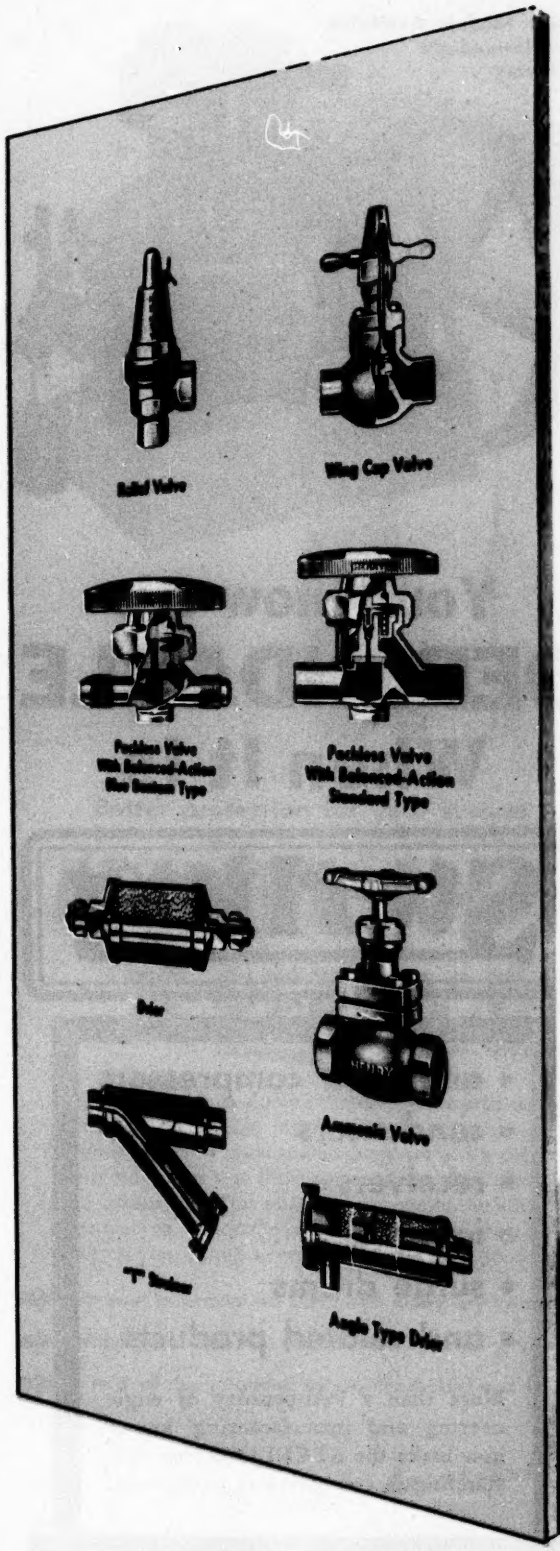

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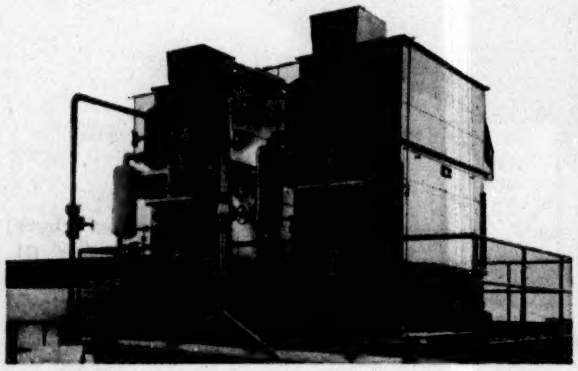

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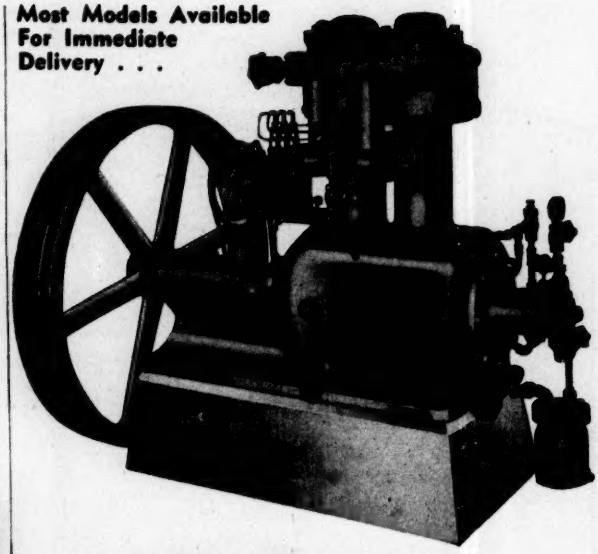

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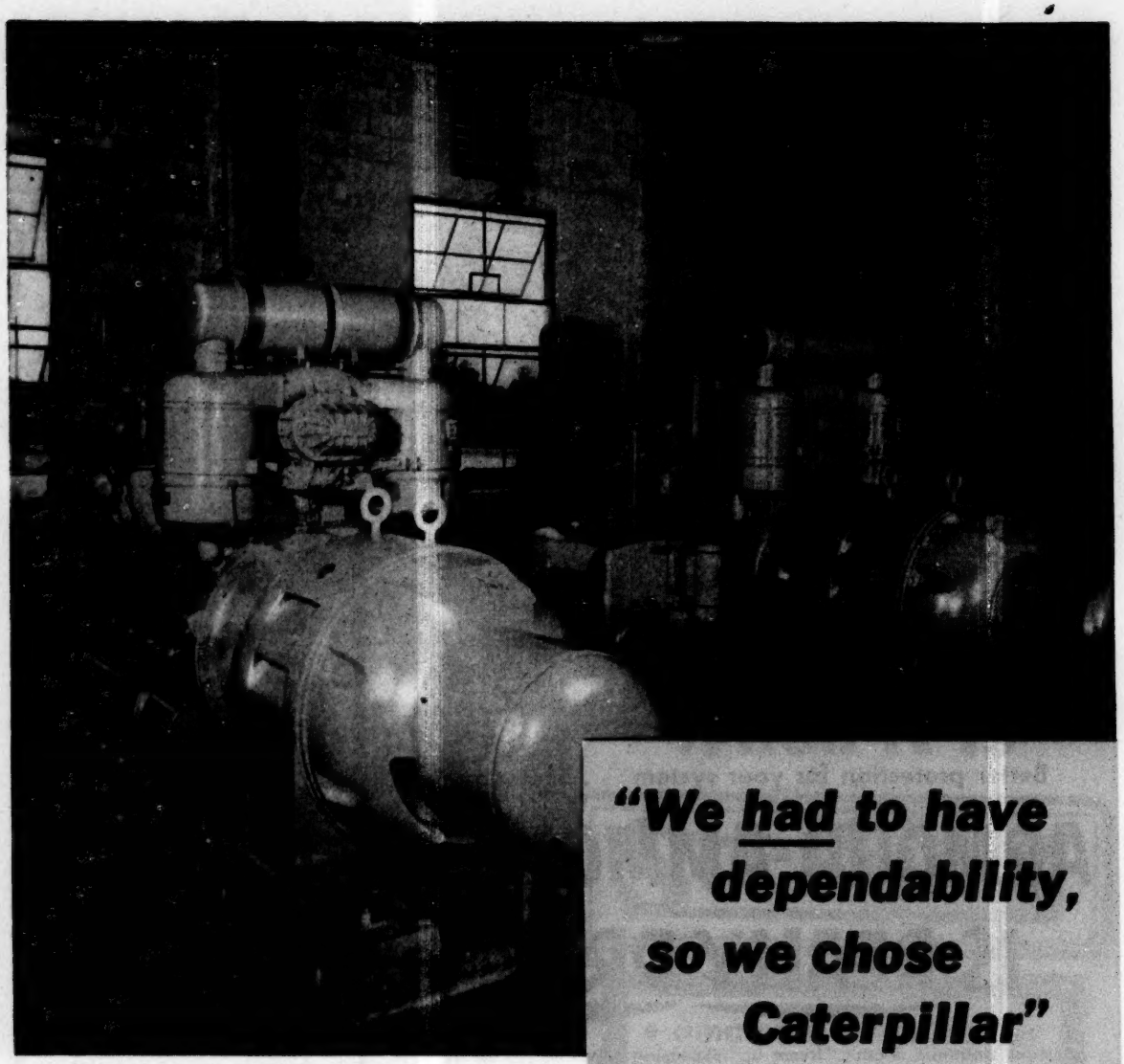
Wichita, Kan.: Thompson-Hayward Co. 727 E. Osie St. 5-9606

Nashville, Tenn.: Sanders, Inc. 712 8th Ave., S. 6-7111



"We had to have dependability, so we chose Caterpillar"

Central Florida Refrigerated Warehouse, Plymouth, Fla., is the largest of its kind in the South. At one time, it may contain more than $25,000,000 worth of frozen citrus concentrate and foodstuffs at zero storage temperature. The warehouse has installed two Caterpillar D397 Electric Sets for stand-by power.

"We *had* to have dependability," explained Don H. Burke, general manager, "so we chose Caterpillar."

He added: "We hope we never have to use these engines for any length of time. But if we do, it is a source of great satisfaction to know that we have Caterpillar dependability to protect us."

There are sound engineering reasons why the words "Caterpillar" and "dependability" have become synonymous. All Cat* Engines, like those standing on guard in Plymouth, are products of exhaustive research, careful design and high-quality materials. They are conservatively rated.

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In the Spotlight

THE GROWTH of the frozen foods industry has brought about new demands and new conditions in the construction and operation of refrigerated warehouses. Typical of the changes that have been made in established houses was the conversion and modernization of The Terminal Refrigerating and Warehousing Company, Washington, D. C. Walter Bernd, supervising engineer of Terminal for many years, in an article prepared especially for ICE AND REFRIGERATOIN tells the story of this project, illustrated with pictures, starting on page 17.

COLD STORAGE of Peanuts before processing has been established by studies at the Georgia Experiment Station as beneficial in preventing insect infestation, retarding rancidity and molding, and preserving the fresh color, aroma and flavor. For details and conclusions of the study see page 22.

ICE SALES for 1952, as reported by the National Association of Ice Industries, amounted to 33,738,383 tons, a decrease of only .15 of one percent from 1951. Sales of processed ice increased 4.44 percent. These and other figures are given in the full report which starts on page 25.

ICE is given another boost through a two-page spread in full color by Rums of Puerto Rico in the July 13 issue of Life Magazine. Text and pictures tell how to make beautiful ice punch bowl and how to serve the drinks. For description and pictures, see page 28.

THE AIR INDUCTION Conditioner offers a new and convenient method of refrigerating trucks handling perishable items. This new method is described in the article on page 30.

COVER: Picture of ion-exchange mechanism used to demineralize water for making clear ice. The process is discussed and described in article on page 31.

CLEAR ICE is a problem to some ice manufacturers where it is necessary to remove dissolved solids from water used in making ice. One solution of this problem is the use of ion-exchange resins which are capable of removing the solids from the water. This subject is discussed by a recognized authority in the article starting on page 31.

REFRIGERATION ON The Rails, an NAPRE paper starting on page 33 gives a historical sketch of the early beginnings and development of railway transportation of perishable freight. It tells how the modern refrigeration methods have been established on developments from early experimental projects.

A NEW STORAGE house for frozen fish has been added to the Port of Seattle, Seattle, Wash. The new three-story addition is 100 x 147 feet with capacity of 3600 tons. For description and pictures see page 45.

THE AMERICAN Society of Refrigerating Engineers at its mid-year meeting June 28 to July 1 attracted a record-breaking attendance of nearly 700 members and guests. Report starts on page 47.

SHIPMENTS of air conditioning and commercial refrigerating equipment for 1952 were valued at 213 million dollars, representing no change from the previous year, accoridng to a report from the Bureau of the Census, Department of Commerce. See page 51.

60 Years Ago

From the August, 1893 issue of ICE AND REFRIGERATION

THE BURNING of the cold storage house at the Worlds Fair on July 10 last was one of the most appalling calamities Chicago has seen in many years and it will be probably one of the most serious American casualties of the year 1893. The building, a five story structure, 130 x 255 feet, was a complete loss. The Hercules Iron Works which had erected and was operating the plant lost some $250,000 by the fire, with practically no insurance, made an assignment in the County Court for the benefit of their creditors.

AFTER TWO YEARS of publication, the flow of "good words" to the editor's table continued in a steady stream for the gratification of the publishers. As a sample, the following comments are from an ice man in Fort Smith, Ark. "ICE AND REFRIGERATION is the best paper of the kind published and we would not be without it."

THE MONTH of July has been most favorable to the trade in all parts of the country, the weather having been very warm all through the month. The factories in the South all report a good business while the trade North seems to have all the business it can handle. Prices remain firm and there is less complaint by the trade of price cutting than has been heard for several years. It really looks as though the season would be a profitable one.

THE NEW PACKING house of the Nashville, Tenn. Packing Company is about completed and will be started up September 1 with capacity for 1,000 hogs, 150 cattle and 300 sheep daily. The company is capitalized at $500,000, a large part of which is held by John Cudahy. The number of men employed will reach 200. The cold storage room for cured meats contains 24,000 square feet and will be kept at a temperature of 42 F.

A TABLE prepared for a New York insurance company in 1890 lists the value of refrigerating machinery in various cities. From this ICE AND REFRIGERATION draws the conclusion that "it may be safely estimated that there is within the United States at least $25 million invested in refrigerating and ice making machinery."

4 REASONS FOR STYROFOAM'S LONGER INSULATION LIFE

Easy-to-install, feather-light STYROFOAM resists water vapor, mold and rot . . . has high structural strength

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You'll save considerably on labor costs when you install lightweight Styrofoam because it is not only easy to cut into desired shapes with ordinary woodworking equipment, but is also easy to handle and install.

Laboratory and field performance tests have shown that Styrofoam is the most nearly perfect low-temperature insulating material yet developed. Investigate it thoroughly if you are interested in insulation for cooler and freezer rooms or refrigerated trucks, railroad cars or ships. Write today for the free Styrofoam data booklet containing further information on how Styrofoam delivers exceptionally effective insulation at an extremely low cost per year of service life. THE DOW CHEMICAL COMPANY, *Plastics Department*, Midland, Michigan.

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Conversion and Modernization of Multiple Story Refrigerated Warehouses

THE growth of the frozen foods industry has brought about radical changes in both the construction of new warehouses and the operation of existing cold storage facilities in the last decade. Much has been written and published on the subject of new construction, such as one story buildings, 20 odd ft ceilings, construction of zero rooms on ground surface, pallet piling and fork truck handling, as well as motor transportation of warehouse stocks. Some of these ideas and methods have yet to prove their worth and it is too early to say that all are a panacea for the cold storage operators' problem.

While there has been some new construction since 1940 to take care of the growth in frozen food products, by far the largest amount of freezer space has been provided by the conversion of cooler space already in operation in multi-storied buildings. These multi-story facilities are generally located in or near metropolitan areas and should hold their own in competition with the single floor operation which should have lower handling costs, but which have to be constructed in outlying areas where land values offer economical construction.

Multi-Story House

The Terminal Refrigerating & Warehousing Corporation of Washington, D. C., operates two of these multi-storied warehouses located in the downtown areas adjacent to the wholesale markets of Washington. One was constructed in 1908, enlarged in 1915, and the other in 1922. Both buildings have seven storage floors and one delivery floor. As originally constructed and until 1940, both of these warehouses contained over two million cubic feet of refrigerated space divided as follows: 143,000 of freezer space and 1,868,000 cubic feet of cooler space.

Late in the thirties, it became evident that additional freezer space would have to be provided to take care of the frozen food industries. It was also noticeable that cooler demand was falling off, which from a construction standpoint was both desirable and fortunate. If freezer space was to have been provided then and cooler space maintained at the former level, construction costs would have been prohibitive, whereas the cost of conversion was much more simple and economical.

WALTER E. BERND
Supervising Engineer
Terminal Refrigerating and Warehousing Company
Washington, D. C.

WALTER E. BERND, a past president of NAPRE, prepared this paper on special assignment for ICE AND REFRIGERATION. Terminal Refrigerating and Warehousing Corporation, of which Mr. Bernd is Supervising Engineer, has been undergoing conversion and modernization since the late nineteen-thirties. The Editor felt that the experiences and methods employed by this firm and the author would be of considerable interest to ICE AND REFRIGERATION readers. Mr. Bernd is a member of ASRE, and the District of Columbia Professional Engineers. He has been in the refrigeration field since 1905, and is a 30-year member of NAPRE.

Since the Terminal Refrigerating and Warehousing Corporation facilities were the only space available in the District of Columbia for the storage of foods and vegetables, care had to be exercised not to cut off too much cooler space immediately but still provide freezer space as the demand increased. Conversion started in 1939 and carried through to 1950. At present the Terminal Company operates 421,000 cubic feet of cooler space and 1,681,000 cubic feet of freezer space. (These are net quantities of storage space and not gross figures.) See Table 1.

Conversion was first started in the No. 2 plant built in 1922, and carried out in this building in three separate programs, 1939 - 1940 - 1941. In order to avoid operating coolers under or over areas being converted to zero rooms, the building was divided vertically into three sections. Each section was converted from the second to the eighth floors taking the east section first, then the center and finally the western section of the building. In order to increase the insulation to seven inches, the plaster finish was removed from the surface of the existing four inch insulation. If the cork was tight to the wall, an additional three inch layer was added to the four inch cork using a hot binder. The surface was then plastered. The floor slot and the column slots with their four inch insulation were left as is.

Where the cork insulation originally installed had come loose from the building wall, it was removed and two layers of two inch and one layer of three inch cork were put back to bring the total thickness to seven inches. The first layer was applied to the wall with cement plaster. The succeeding layers were applied with hot asphalt and the surface plaster finished.

Refrigeration

The entire building is refrigerated with calcium brine in both the cooler and freezer sections. Two 100 ton brine coolers were installed originally. However, the amount of freezer space originally installed did not require more than 20 tons of work on the low temperature brine coolers. Therefore, in converting this section of the building, the original brine cooler and pump installation was found sufficient to take care of the new freezer work. After conversion, the brine coolers operating on the 32 degree rooms also handled pipe-line refrigeration which we were fortunate to secure. The brine circulating system is of the three-pipe balance type, one system for the higher temperature brine and another system for the freezer requirements.

Refrigerating the rooms converted to freezers required that additional two inch pipe coils be added to the existing ceiling coils to obtain minus five degree temperature with minus 12 degree brine. All connections to the new freezers were, of course, transferred to the three-pipe freezer brine circulating system. The brine mains in the vertical pipe shaft had to be increased in capacity to allow sufficient circulation of brine at a minimum friction loss. This was done by tapping the brine mains at the largest diameter and running pipe up the shaft where it was tied into the mains at the sixth floor so that the

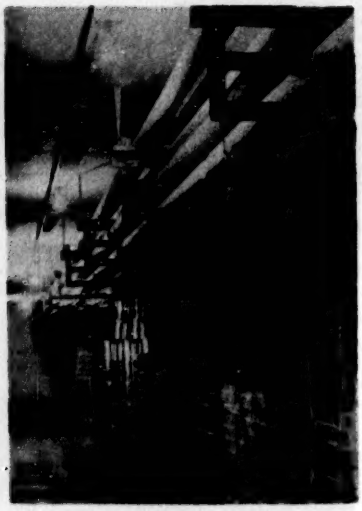

Fig. 1. Ammonia coils in aisle space, No. 1 plant.

upper levels would receive an equal amount of brine with the lower floors. When the original cold storage buildings were completely converted to freezer, the brine coolers and pumps installed were loaded to their capacity so that plans for further conversion of the annex to No. 2 plant was halted and additional space allotted for conversion in No. 1 plant.

Freezer space in No. 1 plant was originally refrigerated by direct expansion ammonia and two inch pipe coils hung over the aisle in the rooms. (Fig. 1). All coolers were refrigerated with brine coils hung from the ceiling in the aisle spaces. These coils were removed from the coolers and new ammonia coils were hung in their place. These were of sufficient surface area to maintain a minus 10 degree temperature at a five lb suction pressure in the coil. All pipe joints and connections were electrically welded throughout including flanged valves and no thread joints were used. Automatic thermostatic expansion valves were installed on each coil in the building.

TABLE 1: CONVERSION CALENDAR, TERMINAL REFRIGERATING & WAREHOUSING CORP.

1939—No. 2 Plant	Convert Half Building (all coolers) in 3 steps	500,000 cu. ft. from cooler to freezer.

Add two inch brine pipe coils to existing ceiling coils and modify brine circulation system.

1945—No. 1 Plant	Convert "B" Building—5 floors.	500,000 cu. ft. from cooler to freezer.

Replace brine coils with new ammonia coils, all welded construction and added 500 cu. ft. booster compressor.

1949—No. 1 Plant	Convert "A" Building—3 floors.	300,000 cu. ft. from cooler to freezer.

Left old brine coils in place over aisles to function when rooms used as coolers; installed new direct expansion ceiling hung diffusers for freezer operations.

1950—No. 2 Plant	Convert Annex 3 top floors.	400,000 cu. ft. from cooler to freezer.

New direct expansion ceiling hung diffuser units installed; added 500 cu. ft. booster compressor and replaced 525 cu. ft. NH_3 compressor. (Further alteration and modification halted from 1942 through 1946 due to government restrictions)

1948—Altered Ice Plant—increased output from 200 tons to 225 tons and cut down ice plant personnel.

1949—Installed cooling towers.

1950—Modified cooling towers and abandoned spray pond.

First Conversion

The first section converted in the No. 1 plant was five floors in what we call the "B" building, in 1945. This was slotted floor and column construction. Being unable to procure corkboard, we decided to use Foamglas for insulation. After removing the plaster finish from the surface of the existing four inch cork insulation and finding it in good condition, Foamglas was applied to the corkboard using Enamelite for a binder and also on the surface as a finish. Horizontal wood stripping of 2x6's was erected against the wall surfaces to prevent damage to the Foamglas during warehousing operations in the event commodities fell from the pile and struck the wall surface. This, you will appreciate, would crack the Foamglas and destroy its insulating qualities.

On the lower freezer floor, seven inches of Foamglas was placed on the concrete surface and in turn covered with a four-inch wearing floor. All columns on these lower floors were insulated to a distance of five feet above the floor and received a plaster finish.

In the "A" building, constructed in 1908, insulation is six inches of granulated cork between two walls and 12 inches of granulated above the ceiling on the eighth floor. It was decided not to increase the insulation except in the elevator and stair shaft walls. This insulation was increased to seven inches with corkboard. This conversion was made in 1949.

For freezer refrigerating in this building, diffuser units were hung from the ceiling. (Fig. 2). Brine coils were left in place should it be necessary to again operate these particular rooms as coolers. Thermostatically controlled expansion valves maintain a constantly super-heated gas leaving the units. An advantageous feature in the operation of these diffusers is the defrosting operation. It is accomplished by electric grid units installed within the unit itself. Water from defrosting is collected in a pan directly underneath the unit. Several hours after the defrosting period, this water becomes ice and is removed by hand. The pan is simply removed, the ice taken out and the pan replaced again. This manner of defrosting eliminates trouble with frozen drain lines.

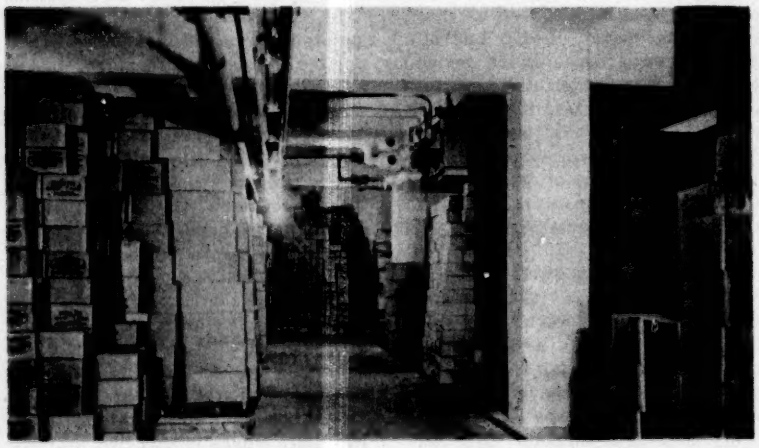

Fig. 2. Ceiling hung diffuser units used in both plants.

Last Conversion

The last conversion to freezer space was made in 1950-1951 at the No. 2 plant. When this building was originally constructed, half of it was constructed for warehousing merchandise or dry storage. About 1925, it was

decided to insulate the three top floors and use them for apple storage; brine being the refrigerant. Now in 1950 when it became necessary to convert to freezer space, several problems presented themselves: insufficient brine cooler capacity; cork insulation was applied to the ceiling of the eighth floor instead of on the roof; four inches of cork was applied to the sixth floor and covered with a 4 inch concrete wearing floor.

The fifth floor was occupied by a wholesale grocery company, and flour, sugar, and like commodities were stored here directly beneath the freezer space. To insulate above this space and operate it as a freezer involved excessive costs of construction due to the increases in corkboard prices and labor. It was believed necessary to remove the roofing membrane and apply insulation to the roof and then re-roof it, or to remove the four inch cork from the ceiling and apply eight inch cork in a manner which would stay in place. It was not believed that additional cork could be added to the present insulation with any assurance it would stay there.

Insulation Problem

Therefore, the following was decided upon: remove the four inch concrete wearing floor from the sixth floor, apply three inches of corkboard on the 4 inch corkboard originally installed embedded in hot mastic, and then cover with a one and one-quarter-inch t&g maple floor nailed to wood strips laid in the top layer of insulation. This prevented sweating of the ceiling of the fifth floor. The exposed walls and the ceiling of the eighth floor remained as they were.

As we were purchasing power at six mills per kwh for driving the ammonia compressors, it was believed that the increased heat gain through the four inch cork over conventional eight inch thickness for freezers would require a good many years of operation to offset the cost of adding insulation to these three floors. This 400,000 cubic feet of freezer space has been operating three years and a careful comparison of the power consumption does not show an appreciable increase in operating cost over cooler operation with only four inches of insulation.

Ceiling hung diffuser units were installed in these rooms. They are the direct expansion type utilizing automatic electric defrosting. Here again the defrosted water is collected in a removable pan and when frozen is removed and taken out. We have had a good bit to say here with regard to the application of this particular type diffuser. Care must be taken as to what use is to be made of a low temperature room where it is intended to install these units. They were constructed with coils running through a series of plates or fins, and the clearance between these fins is very small. If a very large amount of moisture is absorbed in freezing products, trouble is sure to be encountered in keeping the proper air circulation through the units due to accumulation of frost. The zero temperature rooms in which we use these units are for the storage of packaged goods and frozen concentrates, therefore the frost accumulation due to moisture is at a minimum. We are conducting experiments now on the amount of moisture collected in the rooms with these units. Thus far, we only defrost the unit once each 24 hours.

Other Construction Features

This completes description of the conversion of cooler to freezer programs in both of our cold storage warehouses as far as re-arranging piping and insulation construction is concerned. There are several other items which are applicable to both warehouses which may be of interest and are enumerated as follows:

COMMODITY HANDLING: No material changes were made in our method of commodity handling in either plant brought about by the conversion of coolers to freezers. All of our goods are handled principally on regular warehouse trucks. Roller conveyors are used in unloading railroad cars at the platforms and highway trucks at our truck platforms. The only electrically driven transportation equipment within the warehouse, itself, is a power-driven hoist for handling skids in and out of our sharp freezing room.

DOOR OPENINGS: No changes were necessary in the building at elevator doors. The cooler doors were removed and replaced with super-freezer doors fastened to new wood bucks extending from the floor to the ceiling and thoroughly secured at these points. In the early conversions, we installed the super-freezer, overlapping door, 4 foot 6-inch by 6 foot 6-inch size, but after a couple of years use, we decided to go back to in-fitting super-freezer doors having only single door gasket. This decision was brought about by the abuse of the super-freezer doors by the warehousemen who in passing trucks in and out of the rooms continually damaged the door gasket. All refrigerator doors are Jamison Cold Storage Door Company's, Hagerstown, Maryland.

DEFROSTING: In the zero temperature rooms refrigerated with calcium brine, defrosting is accomplished with a warm brine system described as follows: There are two 1000 gallon tanks located in the areaway on the 8th floor, from which warm brine flows for defrosting. In order to do this, the coils to be defrosted are isolated from the regular brine circulating system with shut-off valves, the warm brine lines are opened into the coils and warm brine is pumped through displacing the cold brine which is returned to one of the tanks on the eighth floor. This operation is done with sufficient speed so that very little frost is melted. The dry frost falls off on the floor and from this point is shoveled up and carted to the defrost melting tank located in the basement. The usual method is to defrost one room each day when the defrosting operation is started, which is in March, and usually finished up by the first of May. Only one defrost operation is required per year.

Hot Gas Used

In the zero rooms refrigerated with ammonia coils hanging in the aisles, hot gas from the discharge mains of the ammonia compressors is used for defrosting. The hot gas connection is between the coil and the suction shut-off valve to the coil. Defrosting is accomplished by first closing the valve on the main liquid line to the building, then closing the suction valve on the coil to be defrosted, opening the liquid by-pass around the thermal expansion valve to the coil. Then the hot gas valve is opened. The liquid condensed in this operation is returned to the main liquid line and expanded into the rooms where defrosting is not taking place. Here again the amount of water from the defrosting operation is negligible. The frost drops to the floor and is carted out of the room. The defrosting period here also occurs only once a year. As mentioned, the diffusing units are automatically defrosted daily and the defrost water caught in the drip pans and removed after it is frozen.

Two other radical changes in our No. 2 plant were made in 1943 which are unique, and not very many installations of this kind will be found. The ice plant located in the basement had four freezing tanks using 11½x 22½x45 inch cans. Three cans were harvested at one time, and the thawing, dumping and conveying system was located in the center of the tank room.

With the increased cost of labor and the number of men required to harvest 200 tons of ice, steps had to be taken to modernize this equipment.

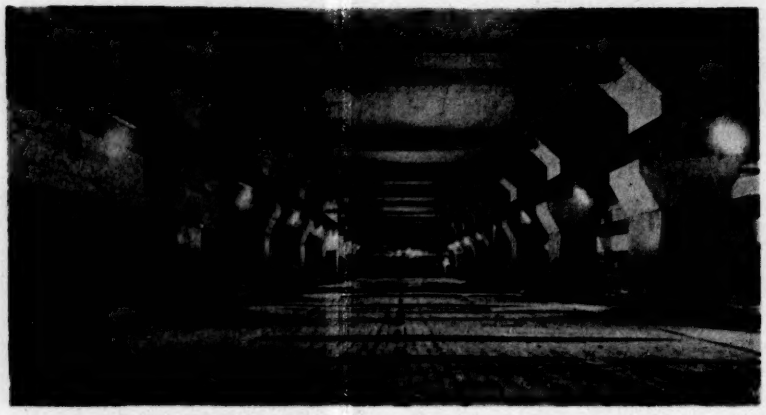

Fig. 3. View of ice tank containing 86 rows of cans.

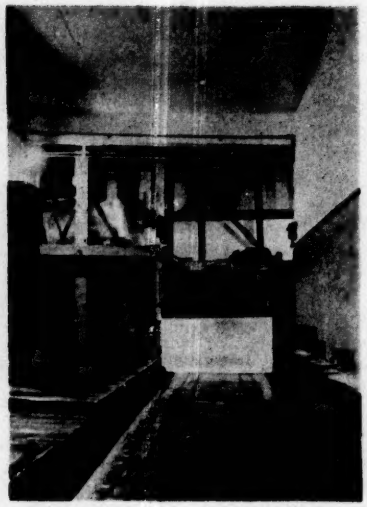

Fig. 4. Automatic ice handling by conveyor and hoist to storage located on upper level.

During construction it was necessary to produce approximately 100 tons of ice per day to take care of the local trade. Clearances between the columns and headroom above the tank was limited so that in the final design, we did not have even one inch clearance to spare at critical places in the building. It will be noted from Figs. 3 and 4, just how this was accomplished. The two rear tanks were moved up immediately adjoining the two tanks in the front of the building and the rear wall of the building proper was cut. Additional space was provided on a vacant lot in which to install the dump and ice handling equipment below ground. Next, 11 by 22-inch can grids were installed. Cranes and equipment were modified to pull a row of cans at a time. There is a total of 86 can rows from one end of the tank room to the other.

Ice Handling

Note Figure 4 showing the ice handling equipment. Ice handling is all by electrical sequence. When the man pulling ice, dumps the row on the chain-slat covered conveyor, he automatically starts the conveyor and delivers the ice to the hoist. The hoist then delivers it to the storage room without any attention from the ice puller. He can go on about his business and other work on the freezing tanks. With these alterations the capacity was increased to 225 tons. Seventy-five tons of ice is harvested and the cores drawn by one man on each eight-hour shift.

After all of the above improvement and modifications were made, it was then necessary to rebuild the condenser water cooling system. In the original installation cooling was done by a spray pond on the roof. With the high humidities in Washington during the summer months, we had periods where the water was going into the ammonia condenser as high as 95F which gave us excessive condenser pressure. Limited to structure heights above the street level by Federal regulations, and having no areas on the ground on which to erect induced draft cooling towers, we decided to install ten horizontal draft cooling towers as shown in Fig. No. 5. The spray pond had three lines of nozzles running from east to west. In order to continue operation while installing these new towers, the south supply line was disconnected and a bulkhead erected in the pond to allow the removal of approximately 15 feet of the spray pond pan to make room for the erection of the new cooling towers. This work was started in December 1950. The towers were completed and ready for operation in April 1951. Meanwhile, the plant had been operating all winter on the two lines of sprays.

When the new cooling towers were put into operation, it was found that their construction was such that the condenser water could not be cooled to less than 15 degrees of the wet bulb thermometer. Fortunately, we could still operate with the spray pond in conjunction with the cooling towers. By reducing the flow of water much below the guaranteed capacity of the towers, we were able to operate through the summer months at a sacrifice of power.

After the cooling tower contractor had failed in several attempts to bring these towers within their guarantee, he was relieved of further responsibility. The towers were then rebuilt under Terminal supervision with an entirely different design of deck spacing which opened up the air passages through the tower so that at least 30,000 cfm of air could be drawn through the tower by the fans. The original difficulty was that the wood packing was installed in such a manner as to restrict the air flow to a point where the fans could not han-

Fig. 5. View of ten horizontal forced draft cooling towers.

Fig. 6. Front view of cooling towers.

dle the amount of air required to cool 330 gpm per tower.

Tests run on these modified towers over the last couple of years have shown that they cooled the condenser water to within 5 degrees of the wet bulb at 75 degrees F, and a dry bulb of 85 degrees. The original spray pond required about 8 lbs. of pressure on the water at the spray nozzle tip, and therefore restricted the capacity of the two 2,000 gallon water pumps operating on this cooling system. The installation of the new cooling towers reduced the total head on the pumps to a pressure where they can now, when both are running, deliver about 3600 gpm over the ten towers. We have found that the towers do their best work when a total of 3300 gpm is circulated.

It will be noted from Fig. 6 that water mains to these towers are of a rather large diameter. This serves two purposes: It cuts the friction loss of the piping system to a minimum; and, most important, it allows for a fairly even distribution of water over each and every tower. We did, however, find it necessary to install a gauge glass 12 inches below the high point in each branch line to the towers, extending the gauge glass above the level of the water outlet, in order to regulate the water to each tower by maintaining the same level of the water in all gauge glasses. We found that it required some adjustment of the branch valves at both ends of the header. From towers three to seven. the distribution of water was fairly equal without any adjustment of the valves on the branch leading to the tower.

The ten towers are cooling 3300 gallons of water per minute to the stated temperatures. Furthermore, in the wintertime, we are able to bring the water temperature down to where we operate at as low as 70 lbs. condenser pressure. During the winter operation, a maximum of seven towers are used for cooling the ammonia condenser water, one pump being able to deliver about 2,400 gpm over the towers. In temperatures below freezing, ice forms on the front, or the entrance to the towers and will in time, depending on the temperature, materially restrict the air flow through the tower. In order to counteract this, the fans on the towers can be stopped from the engine room, and in a short time the water flowing forward toward the air entrance will cut this ice off and clear the tower. Ordinarily, during the icing period, one or two towers can be cut off at a time for ice melting purposes. This procedure continues over a 24 hour period during severe icing conditions.

As for the new equipment required to make these freezer conversions at the No. 1 plant, we use boosters discharging into the suction of the compressor working on the ice-making system and the brine-line refrigeration carried through the streets. Suction pressure on this system is about 21 lbs. The booster suction is around two to three pounds during the summer months.

At the No. 2 plant, the main compressors are two-stage and here again boosters are used principally on the zero temperature rooms, but the discharge goes into the intermediate compressor of the two-stage ammonia compressors when the condenser pressure is above 110 lbs. During the cool months when condenser pressure is below this amount, the discharge from the boosters goes direct to the ammonia condensers. At this plant, with the boosters' discharge into the intermediate compressor of the two-stage compressors during the summer months, the capacity of the low pressure cylinders working on the ice manufacturing and pipe-line refrigeration is not reduced because these cylinders do not handle the booster discharge gas.

The new equipment required at the two plants was as follows: one 500 cubic foot piston displacement Ingersoll-Rand booster in the No. 1 plant; one 500 cubic foot piston displacement booster in the No. 2 plant; one 8 cylinder York VW type, 750 rpm, direct-connected ammonia compressor having a 525 cubic foot piston displacement.

With the exception of the insulation of the ice freezing system, all new piping and the erection of refrigerating equipment was accomplished by the regular engineering force of Terminal Refrigerating & Warehousing. Cork insulation was supplied and erected by Armstrong Cork. The unit coolers on the direct expansion freezers were furnished by the Drayer-Hansen Co. of Los Angeles. Ice handling equipment was furnished by Gifford-Wood Co. The technical advice and direction was in the hands of Fred Ophuls and Associates.

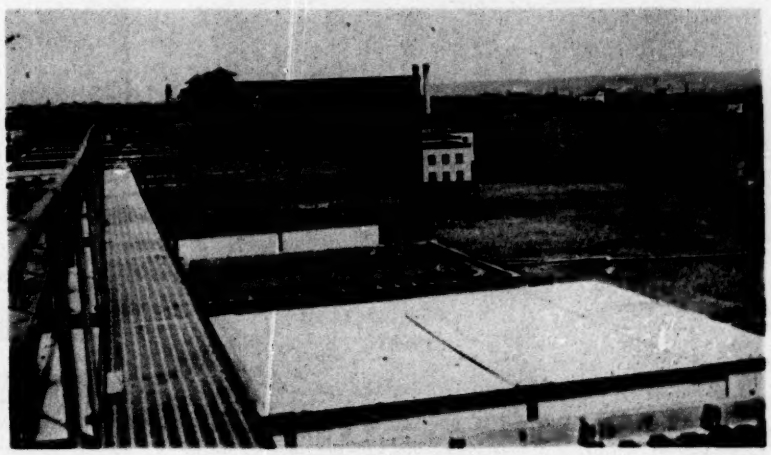

Fig. 7. Top view of cooling towers showing water distribution. Enclosed tower used for test purposes.

Effect of Cold Storing Peanuts on Processing

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THE beneficial effects of refrigerated storage of peanuts for year-round consumption has been established as preventing insect infestation, retarding development of rancidity and molding in peanuts with high moisture content, and preserving the fresh color, aroma, and flavor (2, 3, 4, 5, 6). When stored at 32 to 35 F, with 65 percent relative humidity, and in an odor-free atmosphere, shelled peanuts may be held in good condititon for as long as two years.

In 1950, 496,511,000 pounds of shelled peanuts were processed in the United States. Of this amount, 19 percent was used in candy, 24 percent was used as salted peanuts, 57 percent was made into peanut butter (1). At least 100,000,000 pounds of these were cold stored. As increasingly larger proportions of edible peanuts are being cold stored, a study was made to determine what effect, if any, cold storage had on processing peanuts—blanching, oil roasting, dry roasting, and grinding for peanut butter—and on the appearance, color, aroma, texture, flavor, and moisture content of the products.

Methods

Two series of tests were run. In one series freshly harvested, cured, and shelled No. 1 peanuts of Spanish, Runner, and Virginia types were stored at 86, 50, 32, and 0 F. (Spanish, only), for nine months and then processed by dry roasting, blanching, and oil roast-No. 1 Runner peanuts at 34 and 72F for nine months and processing by light and dark dry roasting, oil roasting, blanching, and grinding into peanut butter. In all, about 500 pounds of peanuts were used in lots varying from 10 to 20 pounds each.

Insects were controlled in the non-refrigerated peanuts by fumigating with 9:1 mixture of carbon dioxide and ethylene oxide, at the rate of 20-25 pounds per 1,000 cubic feet of space, for 24 hours at 70 F. After fumigation the peanuts were sealed in multiwall (burlap paper lined with asphalt adhesive) bags for storage.

All processing was with either pilot-plant or commercial equipment, sensory scoring was by an experienced taste panel of about 20 people, moisture was determined by the atmospheric oven method, and stability was tested by the Schaal oven method.

Effect of Refrigeration

Refrigerated peanuts were much superior to unrefrigerated in appearance and palatability. As shown in Tables 1 and 5, the lower the temperature the higher was the quality after storage for seven to nine months. When stored at 0 F for nine months Spanish peanuts were scored 92 percent in appearance and 94 percent in flavor, with slightly lower scores after oil roasting, blanching, or dry roasting. The oil-roasted peanuts were scored from four to 24 percent higher and the blanched peanuts from nine to 14 percent higher than dry-roasted peanuts.

When stored at 32 F for nine months, Spanish, Runner, and Virginia peanuts were scored 82 to 89 percent in appearance and 79 to 82 percent in flavor; at 50 F they were scored from 77 to 83 percent in appearance and 79 to 82 percent in flavor; at 70 F the score was 32 to 44 percent in appearance and 23 to 67 percent in flavor; at 86 F the peanuts were unacceptable in appearance and flavor.

Practically the same results were obtained when Runner peanuts were stored at 34 and 72 F for seven months the second year.

Results from these experiments showed that: (a) A difference of 10 degrees in storage temperature below 50 was less significant than 10 degrees above 50 F. There was more difference in appearance and flavor between those stored at 70 and 50 F than there was between those stored at 50 and 0 F. (b) Peanuts stored at 0, 32, or 50 F were scored about the same raw and after being oil roasted, but were scored about 5 percent lower when blanched and 17 percent lower when

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Fig. 1—Bags containing 125 pounds of shelled peanuts were stored at four temperatures and samples were taken at intervals for examination of moisture content and keeping quality.

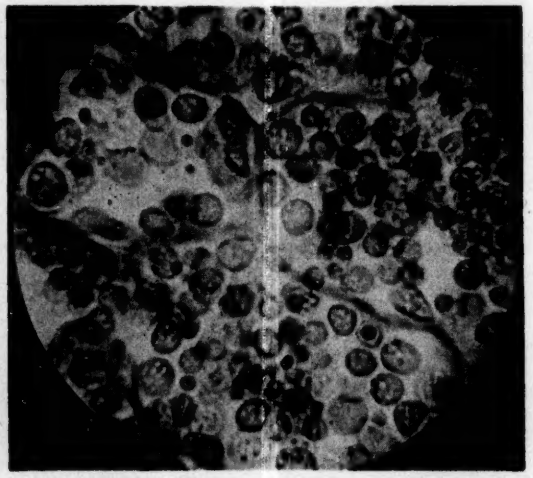

Fig. 2—Cross section of peanut kernel showing (dimly) cell walls, containing aleurone grains (proteins) and droplets of oil. Refrigeration preserved freshness in flavor of peanuts and peanut products but did not alter the processing qualities. There was no injury in freezing cured peanuts.

TABLE 1. EFFECT OF STORAGE TEMPERATURE ON SENSORY SCORES FOR RAW, DRY-ROASTED AND OIL-ROASTED PEANUTS OF SPANISH, RUNNER, AND VIRGINIA TYPES

Variety	Storage Temperature Degrees F.	Appearance, Score*				Flavor, Score*			
		Raw	Roasted Dry	Roasted In Oil	Blanched	Raw	Roasted Dry	Roasted In Oil	Blanched
Spanish	0	9.2	6.8	9.2	7.7	9.4	8.2	8.6	9.6
	32	8.9	5.7	8.8	6.8	9.0	7.8	5.9	7.8
	50	8.3	6.8	8.2	6.3	7.9	7.8	7.4	6.7
	70	3.2	6.7	8.2	7.6	2.3	5.8	6.2	4.3
	86	1.0	5.8	5.6	6.9	0.8	6.4	5.0	2.4
Runner	32	8.4	5.9	8.2	8.3	8.7	6.2	8.9	8.3
	50	7.7	6.3	8.2	8.4	8.1	7.6	8.3	7.8
	70	4.4	7.0	6.2	7.0	5.6	7.2	6.9	6.7
	86	3.7	6.3	5.6	6.4	4.9	6.0	5.8	4.8
Virginia	32	8.2	6.2	9.7	8.8	7.9	8.7	9.7	7.7
	50	8.1	6.2	9.1	9.6	8.2	8.4	9.1	9.3
	70	4.4	6.2	6.9	9.3	6.7	6.9	6.9	7.8
	86	3.8	5.6	5.8	8.1	4.7	5.8	5.8	5.9

*Score from 0 to a maximum of 10.

dry roasted. (c) Peanuts stored at 70 F or above were scored 25 percent higher after being blanched, dry roasted, or oil roasted than when raw. (d) The beneficial effects of refrigeration on appearance and flavor of raw peanuts were more pronounced than with blanched, oil-roasted, or dry-roasted peanuts.

Frequently, peanuts are oil roasted and salted without blanching, and the quality of refrigerated peanuts was compared for this purpose.

Data in Table 2 show that Runner peanuts stored at 32 F for seven months and salted, unblanched, had higher scores on appearance, color, aroma, texture, and flavor, than those stored at 72 F. Slipping of skins during salting averaged around seven percent for refrigerated and eight percent for unrefrigerated peanuts.

Similar data on salted, blanched, Runner peanuts showed no significant differences in appearance, color, and texture, but the peanuts which had been refrigerated were definitely higher than the unrefrigerated in aroma and flavor.

TABLE 2. QUALITY OF REFRIGERATED AND UNFRIGERATED PEANUTS FOR SALTING WITHOUT BLANCHING

Quality	Storage Temperature 34 F score*	72 F score*
Appearance	9.6	8.2
Color	9.2	7.1
Aroma	8.8	6.9
Texture	9.9	9.3
Flavor	8.4	6.6

*Qualities were scored from 0 to a maximum of 10.

Splitting is undesirable in peanuts for salting, confections, and other uses, and was studied in relation to storage.

Data in Table 3 show there was slightly more splitting of Runner peanuts during roasting after storing at 34 than at 72 F. This was probably due to differences in moisture content rather than to storage temperature.

Losses in weight during roasting consisted essentially of reduction in moisture content from about 5.5 percent to 1 percent.

TABLE 3. EFFECT OF STORAGE TEMPERATURE ON SPLITTING OF RUNNER PEANUTS DURING ROASTING

Storage Temperature deg. F.	Moisture Content percent	Splitting during light roasting percent	Splitting during dark roasting percent
34	6.2	63.5	68.0
72	5.1	61.2	61.9

Tests showed that there was in addition a loss of about 0.5 percent of volatile materials, principally flavors. A test was run to determine the relationship, if any, between the storage temperature and loss of volatile flavors during roasting.

TABLE 4. LOSSES FROM RUNNER PEANUTS DURING ROASTING

Storage Temp. deg. F.	Kind of Roasting	Losses in Roasting moisture percent	volatiles percent	total percent
34	light	4.42	.47	4.89
72	light	3.53	.42	3.95
34	dark	5.12	.60	5.72
72	dark	4.05	.56	4.61

Data in Table 4 show somewhat greater losses in volatile substances during roasting following storage at 34 F as compared with 72 F; also, higher losses of volatile substances in dark roasting than in light roasting. Higher moisture losses during roasting at 34 F were due to higher moisture content of peanuts from this storage temperature.

As about one-half of the edible peanuts are ground into peanut butter after being dry roasted and blanched, data were taken on the ease of grinding and quality of peanut butter made from peanuts stored refrigerated and unrefrigerated. This study showed: (a) a definite preference in flavor for peanut butter made from refrigerated peanuts, (b) a slight preference in aroma and texture for peanut butter made from refrigerated peanuts, and (c) a slight preference in appearance and color for peanut butter made from unrefrigerated peanuts. There were no significant differences in ease of grinding.

TABLE 5. QUALITY OF PEANUT BUTTER MADE FROM REFRIGERATED AND UNREFRIGERATED RUNNER PEANUTS

Quality	Storage Temperature 34 F score*	72 F. score*
Appearance	8.9	9.7
Color	9.1	9.6
Aroma	9.0	8.4
Texture	8.8	8.1
Flavor	8.7	5.9

*Qualities were scored from 0 to a maximum of 10.

Though it has been determined that one of the chief advantages of refrigerated storage of peanuts lies in retarding rancidity, an accelerated test was run to determine the relative number of days required for the initiation of rancidity as well as the number of days for definite rancidity to appear.

Data in Table 6 show that twice as many days were required for the initiation of rancidity in raw Runner peanuts stored at 34 F as in those stored at 72 F.; while 2½ times as many days were required for the initiation of rancidity in light-roasted peanuts, and 1½ times as long was required for the initiation of rancidity in dark-roasted peanuts.

The time required for the appearance of definite rancidity in peanuts stored at 34 F was about 20 percent longer than that required for peanuts stored at 72, whether raw, light-roasted, or dark-roasted.

Moisture Content

High moisture content peanuts blanched poorly. The moisture content of peanuts, varying with the humidity of the surrounding air, influenced the ease of blanching, splitting, and roasting.

Previous reports have shown that molding occurred when the moisture content remained above seven percent, and breakage and splitting were increased when the moisture content was below five percent (2).

Data in Table 7 show the changes in moisture content of Runner peanuts during storage and processing. In most cases the moisture content rose to almost eight percent during refrigerated storage, and fell to about five percent during common storage. In either case roasting reduced it to about one percent.

As most processed peanuts are blanched, the ease of completeness of blanching of stored peanuts was studied.

Data in Table 8 indicate: (a) Vir-

TABLE 6. EFFECT OF STORAGE TEMPERATURE ON RATE OF DEVELOPMENT OF RANCIDITY (ACCELERATED SCHAAL METHOD AT 146 F.)

Storage Temperature deg. F.	Condition	Time for Initial Rancidity days	Time for Definite Rancidity days
34	raw	4	14
	light roast	5	22
	dark roast	3	22
72	raw	2	9
	light roast	2	18
	dark roast	2	18

ginia peanuts blanched slightly better than Runners, irrespective of the moisture content or storage temperature, (b) peanuts with about five to six percent moisture content blanched more completely than those with higher moisture content, and (c) storage temperature, as such, had no effect on the ease of blanching.

In most cases the peanuts that blanched only slightly or not at all were small, misshapen, or showed signs of disease or immaturity.

TABLE 7. MOISTURE CONTENT OF RUNNER PEANUTS DURING STORAGE AND PROCESSING

Condition	Storage Temperature deg. F. 34 moisture percent	72 moisture percent
Before storage	6.5	6.5
Seven months in storage	8.4	5.0
Two months in equalizing room	6.8	6.8
After light roasting	1.9	1.6
After dark roasting	1.1	1.1
After blanching	1.1	1.0
Peanut butter	1.0	1.0

TABLE 8. EFFECT OF VARIETY, MOISTURE CONTENT, AND STORAGE TEMPERATURE ON BLANCHING OF PEANUTS

Variety	Moisture Content percent	Storage Temperature deg. F.	Fully Blanched Peanuts percent
Runner	5.14	74	88.00
	5.50	86	74.23
	5.84	70	86.16
	6.16	34	85.05
	6.53	32	73.52
	8.93	50	60.83
Virginia	5.32	86	84.25
	5.96	70	79.76
	6.17	32	81.20
	8.51	50	75.17

Summary

Refrigerated storage of peanuts had a marked effect on preserving the fresh flavor of peanuts and peanut products, had a slight effect on preserving the fresh aroma and color of peanut products, but had little or no effect on the ease of blanching, oil roasting, dry roasting, or grinding into peanut butter.

Refrigerated peanuts maintained slightly higher moisture content than those in common storage, and the higher moisture tended to reduce splitting, but increased the time of roasting and the difficulty of blanching, unless removed before processing.

Peanuts stored under refrigeration for nine months from the time of curing and shelling, looked, tasted, and processed like "new crop nuts," while those in common storage for more than a few months looked, tasted, and processed like "old crop nuts."

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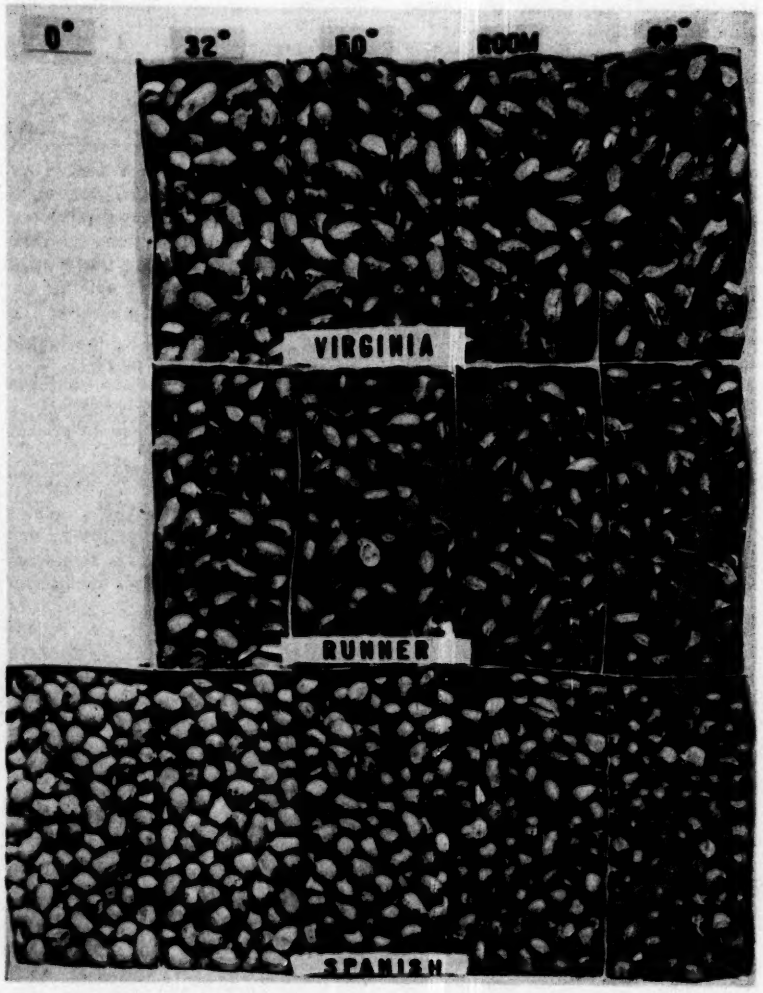

Fig. 3—Samples of Virginia and Runner peanuts stored at four temperatures, and Spanish peanuts stored at five temperatures. Refrigeration preserved the natural texture, color, and flavor without altering the processing qualities.

THE ICE INDUSTRY

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THIS MONTH IN BRIEF

Ice sales for 1953, compiled from figures reported by members of the industry, amounted to 33,738,383 tons, only .15 of one percent off from last year. Processed ice, ice cubes, sized ice and crushed ice showed increases over last year, from 3.27 to 5.39 percent more than last year.

Cooperating with the ice industry, Rums of Puerto Rico had a beautiful full-color double page advertisement in a recent issue of Life Magazine. The ice industry has a wonderful opportunity to take full advantage of this advertisement through their local advertising.

The ion-exchange process as a means of treating water for manufacture of clear ice has been a subject of study for many years. Now, the major problems of demineralization have been well clarified and certain principles of application have been developed.

The air induction system has been developed as a method of refrigerating trucks with ice, with moderate installation and maintenance cost and satisfactory results.

33,738,383 TONS OF ICE SOLD IN 1952

Annual Survey of National Association of Ice Industries Shows Sales of All Processed Ice Continuing Upward Trend. Total Sales Only .15 of One Percent Less Than in 1951

THE annual report on sales of ice compiled by the National Association of Ice Industries shows an optimistic picture for 1952. The figures, according to the report, show a very slight decline of all ice sold of only .15 of one per cent. And sales of all processed ice including ice cubes, sized ice and crushed ice all showed substantial increases over 1950, ranging from 3.27 to 5.39 per cent.

The report states that when the figures for 1952 are compared with those for 1951, the contention in last year's report that a post-war "levelling-off stage has been attained", appears to be further substantiated.

Sales About Same

Despite a slow spring due to cool weather in 1952, for all practical purposes total Industry sales were the same as for 1951. The decline of .15 of 1 per cent is so small that margin of error in the data completely eliminates its significance. By Divisions, five had increases in tonnage, and five reported declines. Divisional gains and losses were not only equal in number, but they were about equal in intensity.

One of the brightest spots in the figures is shown in Table 1. During 1948, 1949 and 1950 not one Division reported an increase in tonnage. In fact, Divisional yearly losses for the three years ranged from 4.31 per cent to as high as 23.63 per cent. In 1951, however, tonnage was approximately the same as for 1950, and four divisions showed gains. In 1952 with the national tonnage still constant for the third year, five Divisions reflected gains. Some of these were significant, ranging up to 6½ per cent.

Despite new types of competition and losses in sales during the late forties, yearly sales for 1950, 1951 and 1952 are 3½ million tons per year greater than those of 1940, the so-called last normal year before the war.

1952 Ice Sales

Total sales—33,738,383 tons
.15 of 1 percent less than 1951

Processed ice—4,479,801 tons
4.44 percent more than 1951

Ice cubes—785,366 tons
3.27 percent more than 1951

Sized ice—2,017,115 tons
5.39 percent more than 1951

Crushed ice—1,677,320 tons
3.86 percent more than 1951

Operating load factor was:
40.18 percent for 1952
1.95 percent more than 1951

Natural Ice—118,084 tons
.35 percent of Total Sales
43.63 percent less than 1951

Total daily production capacity of plants in active operation was 230,021 ton, 5.02 percent less than 1951.

Total ice storage space in use was 2,660,294 tons, 16.01 per cent less than in 1951.

The Ice Industry

The figures on Processed Ice sales for 1952 are very encouraging (Table 2). Comfort was taken in 1950 that this type of sale had declined only 4.5 per cent from 1949. In 1951 we were delighted by a 7.7 per cent increase in Processed Ice business. In 1952 the trend continued upward with another increase of 4.44 per cent.

Although the 3.86 per cent gain in sales of Crushed Ice was less spectacular than the 11.02 per cent jump for 1951, the increase is important because it comes on top of last year's gain. Sized Ice sales enjoyed a significant 5.39 per cent increase over last year's 7.09 per cent gain. Cube sales edged upward over last year's increase of 2.91 per cent with a gain of 3.27 per cent. Tonnage-wise in 1952, Sized Ice continued to be the best seller of the three, passing the two-million-ton mark.

The greatest tonnage increase of Crushed Ice sales was again in the Southwestern Division (21,173 tons). The largest increase, percentage-wise, however, was in the Mountain States. The Great Lakes Division showed the most sizeable tonnage gain in Sized Ice sales (43,668 tons) and sales of Cubes (17,727 tons). The Southwestern and Mountain States Divisions had the largest percentage gains in Sized Ice sales, and the Northwestern Division had the greatest percentage increase in Cube sales.

Processed Ice Sales

The percentage of companies providing Processed Ice Service (Table 3) is relatively unchanged. The less than one per cent declines shown for Cubes and Sized Ice are too small to count. The 2.25 per cent increase for Crushed Ice makes 1952 about equal to the average of 1950 and 1951. The decline in percentage for 1951 was discounted last year because of a discrepancy due to different companies reporting. This analysis now seems justified.

As would be expected, the total daily production capacity declined. This capacity decrease amounted to 12,149 tons or 5.02 per cent with a corresponding increase in load factor of 1.95 per cent, bringing it up to 40.18 per cent.

We believe that it is quite evident that our research and marketing activities of the past few years are helping the Industry to meet some of the new forms of competition. In spite of tonnage which has been lost to the point-of-use Ice maker and to other forms of competition during the past three years, our figures definitely show that total volume of the Industry has remained constant, and dollar volume has increased. Nor does this take into account lack of cooperation from the weatherman. Any losses due to competition, therefore, have un-

TABLE 1—TOTAL ICE SALES IN UNITED STATES FROM 1948 THROUGH 1952

Division	1948 Tons	% Change Over 1947	1949 Tons	% Change Over 1948	1950 Tons	% Change Over 1949	1951 Tons	% Change Over 1950	1952 Tons	% Change Over 1951
New England	2,303,430	−16.61	2,202,420	− 4.31	1,691,771	−23.63	1,692,702	+ .65	1,803,743	+6.56
Eastern States	8,805,881	−12.75	8,089,142	− 8.07	6,443,032	−20.34	6,356,051	− 1.35	6,471,096	+1.81
Southeastern	6,189,128	− 6.94	5,508,501	−10.93	4,563,314	−17.15	4,570,615	+ .16	4,512,111	−1.28
Southern	3,956,031	− 4.53	3,334,003	−15.66	2,649,015	−20.54	2,608,750	− 1.52	2,440,225	−6.46
Southwestern	5,934,605	− 7.08	4,826,535	−18.61	4,248,922	−11.96	4,828,050	+13.63	4,856,053	+ .58
Great Lakes	8,728,344	−14.28	7,616,718	−12.67	5,960,862	−21.73	5,641,360	− 5.36	5,546,021	−1.69
Western	3,757,786	−13.63	3,222,875	−14.17	2,580,702	−19.92	2,512,571	− 2.64	2,571,365	+2.34
Mountain States	1,573,569	−10.04	1,379,608	−12.26	1,063,307	−22.92	1,055,332	− .75	1,003,832	−4.88
Pacific Coast	5,080,038	−12.53	4,576,302	− 9.84	4,204,076	− 8.13	3,998,497	− 4.89	3,984,502	− .35
Northwestern	661,400	−16.71	586,354	−11.28	502,797	−14.25	525,574	+ 4.53	549,435	+4.54
TOTAL U.S.	46,990,212	−11.28	41,342,458	−12.01	33,897,798	−18.00	33,789,502	− .32	33,738,383	− .15

TABLE 2—TOTAL ESTIMATED SALES OF PROCESSED ICE IN TONS

Division	Ice Cubes 1950	Ice Cubes 1951	Ice Cubes 1952	Sized Ice 1950	Sized Ice 1951	Sized Ice 1952	Crushed Ice 1950	Crushed Ice 1951	Crushed Ice 1952
New England	58,468	59,766	68,578	50,772	52,813	59,858	53,791	56,997	74,464
Eastern States	217,543	221,959	210,321	411,597	431,271	432,856	170,799	189,501	183,493
Sou heastern	65,856	70,631	76,575	268,424	283,509	270,454	153,096	165,436	146,925
Southern	9,648	8,285	9,822	67,825	83,764	95,130	43,903	46,875	48,912
Southwestern	14,967	15,067	16,004	157,947	179,996	209,257	491,013	620,149	641,322
Great Lakes	159,774	155,732	173,459	428,781	451,549	495.217	228,006	227,071	227,734
Western	72,985	78,788	86,210	162,331	173,029	186,553	160,249	152,397	165,953
Mountain States	12,238	12,036	12,551	43,806	42,045	49,082	25,166	26,069	41,200
Pacific Coast	125,888	136,316	129,387	175,488	194,669	195,872	62,309	64,733	67,185
Northwestern	602	1,918	2,495	20,324	21,308	22,836	66,391	65,754	80,132
TOTAL U. S.	738,999	760,498	785,366	1,787,295	1,913,953	2,017,115	1,454,723	1,614,982	1,677,320
% Change Over Preceding Year	−8.46%	+2.91%	+3.27%	−3.81%	+7.09%	+5.39%	−3.28%	+11.02%	+3.86%

TABLE 3—PERCENTAGE OF COMPANIES PROVIDING PROCESSED ICE SERVICE

Division	Percentage Of Reporting Companies Providing: Ice Cube Service 1950 %	1951 %	1952 %	Sized Ice Service 1950 %	1951 %	1952 %	Crushed Ice Service 1950 %	1951 %	1952 %
New England	62.2	80.9	73.9	40.5	57.1	69.6	73.0	57.1	52.2
Eastern States	42.7	38.0	42.4	41.7	46.0	41.4	61.5	45.0	52.5
Southeastern	16.7	17.3	14.2	33.3	29.1	31.1	70.2	72.7	72.6
Southern	11.8	12.7	12.3	34.2	36.4	41.5	56.6	63.6	72.3
Southwestern	12.2	12.1	15.4	24.3	31.3	26.9	75.7	63.8	78.8
Great Lakes	53.7	55.9	55.3	48.3	50.8	52.4	59.9	55.1	55.3
Western	33.3	46.3	46.2	37.5	46.3	38.5	64.6	67.2	60.0
Mountain States	36.8	58.8	41.2	42.1	41.2	47.1	63.2	82.4	64.7
Pacific Coast	70.6	64.0	70.8	32.4	28.0	29.2	47.1	44.0	37.5
Northwestern	23.5	23.1	20.0	52.9	53.8	45.0	47.1	30.7	50.0
TOTAL U. S.	34.8%	36.6%	35.7%	38.3%	41.1%	40.8%	63.5%	59.6%	61.8%

doubtedly been offset by new sales in new markets.

We have received some unusually fine letters this spring from several of our members indicating better-than-usual business and expressing a feeling of optimism. Most of the summer is still ahead, the report concludes. is still ahead. New markets are open to us. On some of these we have scarcely scratched the surface, the report concludes.

Teen-Age Summer Help

AS VACATION time approaches, thousands of teen-agers will be searching for summer jobs. Employers who plan to use them should see that their hiring practices conform both with state and federal child-labor laws. The federal statutes apply only when the employer is engaged in interstate commerce while intrastate activities are subject to state laws. If there is any difference in the federal and state laws the stricter of the two applies.

The Wage-Hour Law (federal) prohibits employment of minors under 14 except agricultural, domestic and newspaper delivery. It requires that all work by employees in the 14-16 age group must be outside of school hours and between 7 a.m. and 7 p.m. During school days they may work only three hours before or after school and during non-school days only eight hours per day and 40 hours per week (no overtime).

Employment of 16-18 age group is permitted provided the work is not hazardous. For the ice industry, hazardous occupations are limited to operating motor vehicles and power driven hoists, cranes, elevators, etc. of more than one ton capacity. Work permits are required. No overtime is allowed.—Ice News.

Ice Carvings Make Hit At Navy Carnival

OFFICERS and enlisted men from the Navy, Marine Corps, Army and Air Force with their families, as well as hundreds of civilians, viewed with amazed admiration, the booth featuring ice carvings at the Navy Carnival held in Jacksonville, Florida recently. B. F. Thomson, progressive manager of the All Seasons Ice & Fuel Company of Jacksonville, was in charge of the exhibit.

This company has devoted a lot of time to the merchandising of ice carvings and they found this exhibit booth at the fair a splendid means of acquainting many people in the city with the fact that these beautiful decorative pieces were available at a moderate price.

Ice Safety Program

AN EFFECTIVE safety program is being carried on for the Railways Ice & Service Company, Topeka, Kansas by L. C. Riggin. An outline of this program is given by Mr. Riggin as follows:

We have safety practice meetings with new and inexperienced employees, and try to teach them to watch out for the other fellow who is new and added to the crew.

We are supplied with most of our safety material from our Chicago office and we arrange to get this material and information before our employees and present it to them periodically.

The Ice Industry

We teach our crew to be constantly on the watch for unsafe practices or unsafe conditions at all times.

We make a special practice of seeing that proper corrections of hazards are made without delay or neglect immediately upon discovery of same.

Our experience for the past few years has been very good as regards employee injuries. Since 1947 we have had very few lost time accidents and those resulting in lost time have been mostly of minor nature, strains, cuts and bruises, with one to three day lost time periods only.

Vacuum Cooling Process for Lettuce Provides Better and Faster Service

ALONG about the middle of April they were boiling the surface water off lettuce in Salinas, Calif. to cool the heads through to their crisp hearts so they would arrive in eastern markets in better condition. Boiling to cool, and they were blowing up some bugs in the process, which further slows down deterioration of the lettuce in transit.

This work is being done in a big pre-cooling plant, called "Frigi-Vac" specially constructed for lettuce at Salinas by the Monterey County Ice and Development Company at a cost of about $200,000.

Monterey County ice helped pioneer in the ice and lettuce business in the Salinas Valley twenty five years ago and now is taking the lead in this progressive innovation. This process involves super-quick cooling of the lettuce, in a vacuum, to about one degree above freezing, as a means of giving added life to the product.

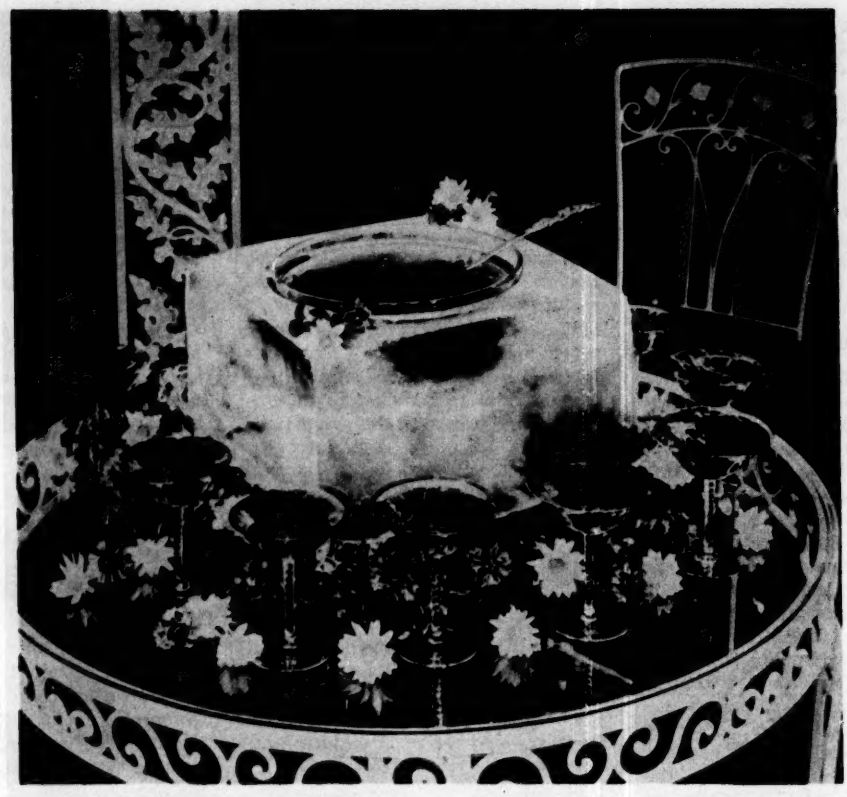
In the truck which hauls lettuce from the field, the crates are stacked on flat pallets, 18 to a pallet. In the plant, these crates, 18 at a time, are picked up by fork-lift trucks, set on a dolly and pushed into one of three vacuum chambers. These chambers, about seven feet wide and 45 feet long, will each hold 162 crates, enough for one conventional refrigerator car, and more than enough to fill one huge transport truck.

When the lettuce is inside the chamber, the heavy doors are closed, the vacuum creating process begins, and the lettuce is cooled down to within one degree of freezing. The process takes about thirty minutes, depending upon the temperature of the lettuce when it entered the plant. Not only is the lettuce chilled to the heart, but certain types of bacteria are destroyed. The moisture which is evaporated from within the head of lettuce is surface moisture; the process does not result in dehydration of the produce itself.

When the quick cooling process is completed, the door is opened and the dollies with their crated lettuce are rolled out to waiting trucks on one side of the building or to refrigerator cars on the railroad siding on the other side of the building. The lettuce shipped by rail is carried in standard refrigerator cars, as it has been, but without top ice. The practice has been to crush from 60 to 80 blocks of ice and blow it on top of the crates to make them keep better in transit, but the vacuum-pre-cooling process has made this unnecessary.

The plant is operated as a service. That is, a charge is made for the cooling job. The current going charge in the industry is 25 cents per crate. The plant has been installed in one of the company's packing houses, which has been completely remodeled to suit this type of operation and will use part of the refrigeration capacity of the ice plant. The plant has sufficient refrigerating capacity to supply the 100 ton per day requirement of the new facility.

One further development coming about in the lettuce industry as a result of this process is the use of fibreboard cartons for carrying the lettuce. This is made possible by the absence of the wet ice and has certain advantages, one of which is that it provides lighter weight for handling and shipping.



This punch bowl and punch ready to serve, decorated with flowers and green leaves made a dazzling picture for full-color two-page advertisement.

Another Boost for Ice—Two Page Color Spread Tells How to Glamorize Summer Parties

Here is a good example of what an association can do when it takes time to work with people who share some of its interests. The National Association of Ice Industries cooperated with Rums of Puerto Rico to make this opportunity available to the Ice Industry.

ONE of the most beautiful advertisements plugging ice by an associated industry appeared in the July 13 issue of Life Magazine. In a full-color two-page spread it told in text and pictures how to use ice for serving drinks with a rum base.

This advertisement launches one of the greatest advertising opportunities the ice man has had for many months. Rums of Puerto Rico, the rum promotion group for all the rums exported from Puerto Rico to the mainland are going "all out" this summer with iceman's ice. In it readers are shown step by step how to make a block of ice into a home-made ice bowl, under the heading "Self-Service Cocktail Party", as shown in the accompanying photographs.

Headed by a beautiful and glamorously dressed-up block of ice, explicit instructions (illustrated) follow, showing the process of making an ice punch bowl in five easy steps. By using this idea, the ad explains, making up the bowl in advance and preparing drinks ready to be served, the host is free to enjoy the party while the guests help themselves to the "Cocktails-in-a-Bowl".

The Idea Explained

Here's a new idea, it continues, for your next cocktail party and one which will leave you free to relax and enjoy your guests. Give a self-service Rum "Cocktails-in-a-Bowl" party, and use a block of iceman's ice to keep the drinks chilled for hours. It's simple. Prepare a supply of rum cocktails in advance, make a hollow in an ice block and your own leakproof tray, and have fun at your own party!

Making up individual drinks is a lot of bother and results aren't always too successful. In Trader Vic's "Book of Food and Drink," this fabulous San Francisco restaurateur has a few pointed comments to make on home parties and how to remedy them. Trader Vic, (Vic Bergeron) is the man, who, according to Lucius Beebe, is deserving of public esteem because "in the same manner in which Aristotle claimed all human knowledge as his province, Vic has taken over the whole world of rums and the knowledge and understanding thereof." So says this gourmet in his food and drink manual.

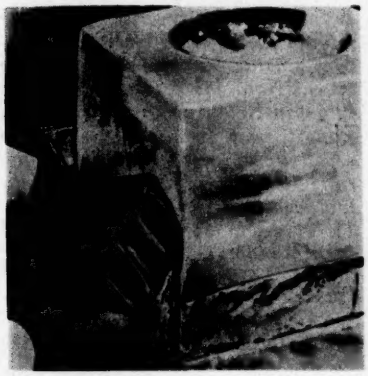
In his book, Trader Vic sagely remarks, "Why some smart hostess hasn't solved the cocktail party problem with a couple of bowls of cocktails is a mystery to me. As a rule the service is slow, the drinks warm and why be so ordinary?"

From a Block of Ice To The Finished Drink—

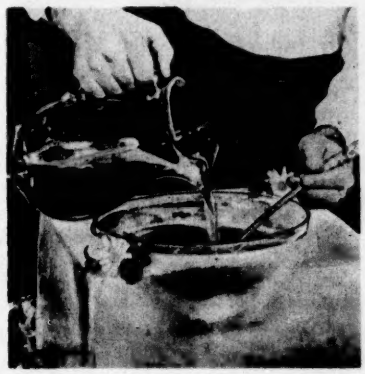
1—Chip out hollow to seat bowl at start. Use gentle slanting stroke to avoid splitting ice. Make hole slightly larger than bowl bottom.

2—Pour boiling water into metal or pre-heated Pyrex bowl (Metak bowl sinks faster). Keep repeating but avoid spilling water on ice.

3—Sponge up water from hollow as ice melts. Any kitchen-type sponge will do. This prevents overflow from marring ice surface.



4—Leakproof tray—join the long way in tight folds two sheets of heavy duty cooking foil. Open out. Fold up sides.



5—Pour in rum cocktails prepared in advance and kept cool in refrigerator. Ice corners flattened with hot iron will add to appearance.

6—Here's one of many finished drinks described and illustrated—A mint crush decorated with mint leaves and with sparkling ice cubes.

Well, now you can be sure your cocktail party wil go smoothly by doing the job before your guests make their appearance at your home. You wouldn't start a luncheon or dinner as your guests were arriving so why not follow the same principles for a cocktail party by having Rum "Cocktails-in-a-Bowl" in readiness.

All you'll need is a block of ice, a Pyrex-type or metal bowl, aluminum foil for a leakproof tray and the best recipe you have for quantity rum cocktails. The whole supply can be made up well in advance and placed in a refrigerator. Remember, there will be no dilution because the cocktails go in the ice and not the ice in the cocktails! Order a 50-pound block of ice from a local ice company and have it delivered about an hour before party time. Use your own ingenuity in decorating the base and top of the ice with green leaves and flowers for an outstanding effect.

A variety of drinks are described, beautifully illustrated, including Daiquiri, Mint Crush, Rum'-n-Pineapple, Iced tea-o-rum, rum Collins, rum highballs, rum-sherry cocktail, rum-port cocktail, and Rum-'n-Tonic.

What This Means To Ice Industry

A national liquor store sales promotion job will plug Puerto Rican Rum and Iceman's Ice in principal cities. Hundreds of thousands of these ad reprints, with the main block of Ice picture to be used as a cover, will be distributed by liquor stores in the form of Rums of Puerto Rico Summer Recipe Guids.

Many dealers placed advertisements in their local newspaper to break simultaneously when the LIFE Magazine ad (July 13) hit the country's homes and newsstands. This can be followed by other ads throughout the summer tying ice products and services into this campaign.

Obviously, the Rum people have featured the home-made bowl because of the general availability of block Ice. For those who make punch bowls, this campaign affords a wonderful opportunity to plug these bowls in local advertising and take full advantage of this national program.

To make it easy the National Association of Ice Industries has prepared mats of the block of Ice in the feature illustration of the LIFE advertisement. These are for the asking. Enclosed with the mats is some copy for local advertising, to be used as it is, or as a guide in preparing individual copy.

This campaign will continue throughout the summer. The idea will command attention. It is something the ice company can plug one time or several times. It is something that can be used in advertising many ice products or services, attractively, effectively, profitably.

Air Induction Offers Cooling System for Trucks Using Ice

ONE-EIGHTH of a million refrigerator cars rumble over the nation's railroad tracks moving dairy products, produce, flowers and other perishables from point of origin to market. In 99 percent of these cars, water ice does the refrigerating job. Efforts to develop another method that can outdo ice in efficiency, dependability and economy make little headway; growers and shippers find that "nature's own refrigerant" remains the only ideal agent for keeping things cold and fresh enroute.

Just as ice serves best in reefer car shipping, so it offers many advantages to the dairy operator delivering his products by truck. It gives him the quickest chilling at lowest cost and with greatest convenience.

Ice Never Breaks Down

One of the prime advantages of ice over any mechanical system is that it cannot break down. This quality saves the user constant worry and fear of heavy loss. Even a brief failure of the refrigeration equipment in a capacity-loaded truck could cost the dairy owner hundreds of dollars. It could wipe out his profit for several weeks, perhaps for an entire season. Measured against this possibility, ice is real insurance.

The dairyman planning adaption of a truck for refrigerated hauling should give careful thought to the economy of ice cooling. Installation of a mechanical unit involves heavy initial outlay, plus subsequent bills for maintenance, repair and eventual replacement. With ice there is none of this. Daily expenditure for ice is economical, too. Water ice ranges in cost between 50 and 75 cents per 100 pounds. Dry ice is approximately ten times as expensive—and like a mechanical unit, it provides dehydrating dry cold.

The cost of fitting a truck for ice refrigeration varies according to the icing method contemplated, but in any case it is comparatively nominal. One method, used mainly in large, long-distance trucks, is the bunker arrangement. It calls for the construction of a compartment or "bunker" at the front of the cargo area. This bunker is filled with chunks of ice. A blower circulates the cold air from the ice over the cargo. When the cargo is especially perishable, it may also be kept covered with "snow ice"; re-icing is necessary at intervals during the trip, frequently depending on the outside temperature. The shipper can employ this "top-icing" and bunker-icing in combination or use either form by itself.

The cargo space in a local delivery truck is usually too small to allow for an ice bunker, so contact chilling is customary in short hauling. Crushed or "sized" ice goes directly around the cans and other containers, providing the most rapid cooling possible.

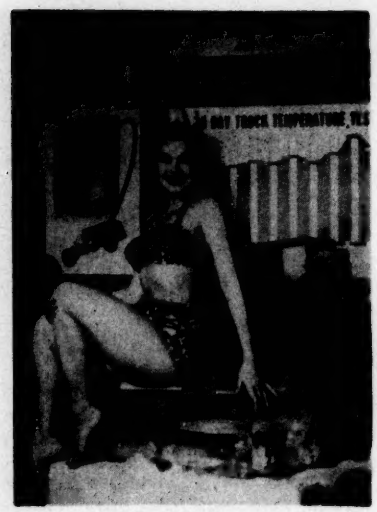
One other expense is usually necessary when ice is to be placed on the cargo. The truck should have metal sheeting laid over the wooden floorboards to prevent their deterioration. If this is not done, eventual replacement of flooring may be necessary.

Air Induction

An alternate method of ice refrigeration for trucks is known as the Air Induction System. Developed 15 years ago, this system entails installation of a non-mechanical, ice-using air conditioner in the front of the cargo space. These units, ranging in capacity from 125 to 450 pounds of ice, provide efficient cooling for insulated truck bodies of up to 700 cubic feet. Their principal is basic: Warm air rising within the body is drawn into an intake vent mounted near the ceiling, down a duct and over the ice, which cools and washes the air. It then goes out an exit near the floor and flows around the cargo, rising again when it has become warm. Through this action, every cubic inch of air in the truck is rewashed every two to three minutes.

A small electric motor to provide the draw at the top vent is the only moving part of the unit. The motor is usually connected to the truck battery via the ignition; it uses no more electricity than an ordinary car heater.

It is claimed that the Air Induction unit will use only about 60 percent of its capacity every 24 hours. For example, a 250-pound-capacity unit would consume about 150 pounds daily—perhaps a dollar's worth. On this amount of consumption the unit maintains an average temperature of 40-44F. in the truck, even when the doors are being opened frequently. The system is especially effective when the truck must be loaded at night to conserve space in the plant. The operator need only load his truck, fill the unit with ice and run the motor for about 15 minutes. He can then turn the motor off, for the cooling process will work by itself and the truck becomes a storage ice box.



MISS AIR INDUCTION of 1953 is curvacious New York model Linda Lombard. She received the title from the Air Induction Corporation during their exhibit at the recent National Transport Vehicle Show in New York. Air Induction Conditioners using Iceman's Ice are the only non-mechanical truck refrigeration systems that maintain temperatures of 40-45 degrees. They are ideal for protection of such perishables as produce, meat, poultry, milk, etc.

A wide drip pan under the ice compartment catches not only the ice meltage, but also any moisture condensing on the conditioner. Through this pan the water drains out beneath the truck. Thus no water falls on the floorboards and they need not be protected with metal. Likewise, with air conditioner cooling, the cargo gets chilled but does not become wet, as it does when ice rests upon it.

Other advantages of the system: It can be installed in an hour, maintenance cost is practically nil, it is rustproof and with ordinary care should last indefinitely.

The Air Induction System, then, yields two major benefits. Using ice, it gives perishables the best type of refrigeration known—pure, gas-free, moist cold. And it does so at lowest cost; average price of the units is less than $250, and as noted before, ice is the cheapest refrigerant purchasable. Besides its cheapness, incidentally, water ice is the most readily available chilling agent in any locality.

It is not claimed that the Air Induction System will maintain below-freezing temperatures, nor refrigerate products requiring such temperatures. But for efficient, economical protection of non-frozen commodities during delivery, this system is unsurpassed.

Ion-Exchange Process to Manufacture Clear Ice

DR. WILLIAM CUNNINGHAM
Professor of Chemical Engineering
University of Texas

FOR many years the only way to remove some or all of the dissolved solids in some water used for ice making in order to make blocks of clear ice was through the condensation of steam, usually after some of the energy in the steam had been used to drive a compressor for the refrigerant. Later chemical treatment was used to improve the quality of the water. More recently, the minerals are being removed by ion-exchange resins which are capable of removing the solids from the water.

Process is Simple

Basically, the ion-exchange process is simple. It involves nothing more complicated than passing the water in series through two beds of crushed ion-exchange resins. In the first bed the cations, or positively charged ions (e.g., calcium, sodium, magnesium) are removed, while in the second bed the negatively charged ions (e.g., chlorides, sulfates) are removed, thus producing a water of essentially the same quality as that obtained by distillation. The ion exchange resins become exhausted periodically, but their original capacity can be restored by proper washing and treating with dilute solutions of an acid and an alkali.

Dr. Wm. Cunningham

The commercial ion exchange resins of today are first-class in every respect, and, from the chemical standpoint, the major problems of demineralization have been well clarified. However, despite apparent simplicity of operation, many ice manufacturers experience difficulty in achieving optimum economy, and find considerable difference in the operational characteristics of their several ion exchange units.

In an attempt to clarify the problems to such an extent that all operators who seek to use ion exchange demineralization on suitable raw waters can obtain satisfactory results, a study of the operating variables is currently underway by the Bureau of Engineering Research at the University of Texas.

Though it is unlikely that this study will develop completely satisfactory solutions to all operating problems, the scope of the investigation is indicated by the following primary objectives:

Primary Objectives

1. Determination of the effectiveness and economics of demineralization of waters ranging up to 1000 ppm total solids and containing various ra-

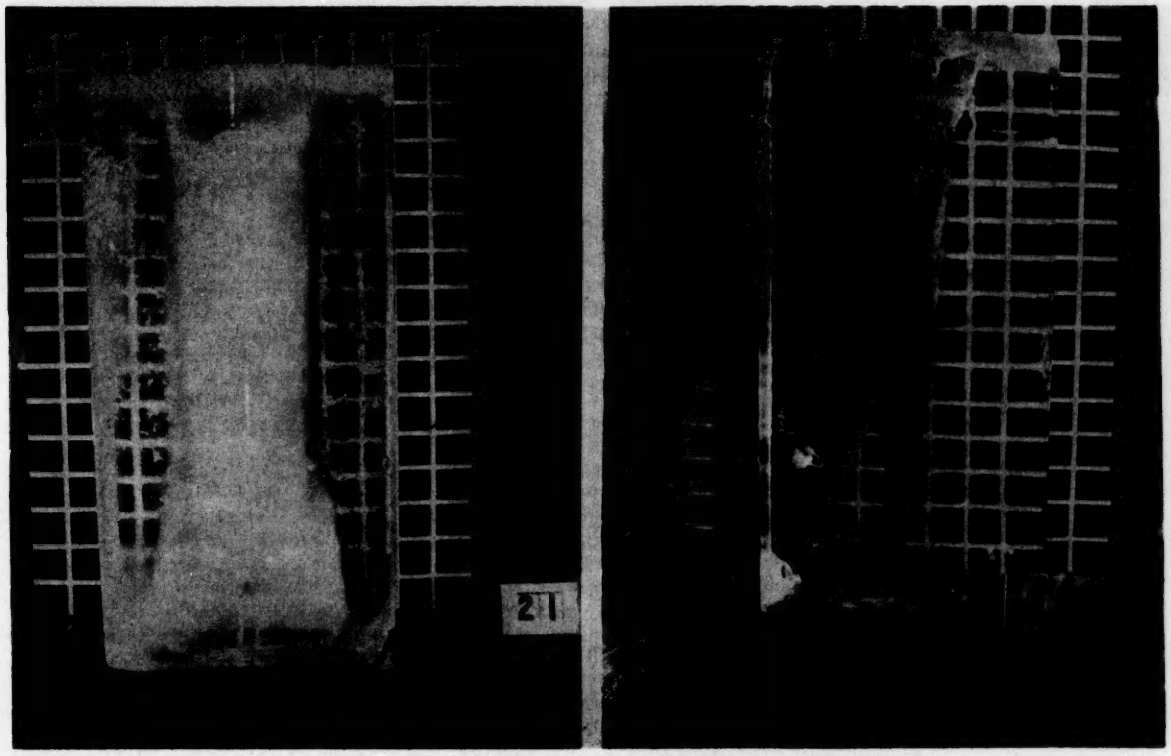


Photo at left shows ice frozen without air agitation or core removal. At right, ice frozen from same water as that in block at left, but with air agitation and core withdrawal.

tios of the dissolved minerals commonly found in natural waters.

2. Study of the relationship between the economy of producing a partially or wholly demineralized water.

3. Study of the effect of demineralization on thermal shock cracking of ice frozen at low temperatures.

4. Study of the effect of washing and regeneration techniques on the economics of demineralization.

5. Obtain information on the operating characteristics of ion exchange demineralization units which affect efficiency and economy of demineralization.

6. Using the above information, together with that obtained by consultation with operators of commercial units, to prepare a bulletin or operators' manual for the ice industry.

Though, of necessity, the experimental work is being conducted on a relatively small scale, close correlation with commercial operation is being obtained by using a commercial ion-exchange unit and by doing the work at a local ice plant in Austin.

Waters ranging from 100 to near 1000 ppm total dissolved solids are demineralized and then the treated water frozen into standard 300-pound blocks to determine the nature of the ice produced. Careful records are maintained so the costs of demineralization and resin regeneration can be calculated.

The experimental program has not yet been completed, but it has progressed to the point that the following findings are indicated:

General Findings

1. By removing all or a major portion of the dissolved solids, core pulling can be eliminated, but air agitation must be used to remove entrained gas bubbles if clear ice is to be obtained under normal operating conditions. The air agitation is not necessary if the water is subjected to vacuum deaeration prior to introduction into the can and if there is minimum contact with air prior to freezing. These observations confirm work done previously by other investigators, but the economics of such procedure are as yet uncertain.

2. A properly operated ion-exchange demineralization unit will produce a better water than is actually needed to produce clear ice when air agitation is used. Hence, for optimum economy, it is advisable to blend the demineralized water with some untreated water in such proportions that the blend will contain the maximum amount of dissolved solids and still freeze into a clear ice without the necessity of core removal. The blending proportions will vary with the quality of the untreated water.

3. The key to economical operation of a demineralization plant seems to be in the efficient use of regenerating chemicals and in the securing of adequate rinsing with a minimum amount of wash water going to waste. Intensive studies of these phases of operation are being made but final conclusions have not yet been reached.

Experimental Work

Experimental work is not yet completed but is being pushed along as rapidly as possible. Work has already started on the preparation of a bulletin in which the theory and practice of ion exchange demineralization will be presented, and in which economics and operating techniques based on the findings of this research project will be recommended.

Because Ice Manufacturers experienced difficulty in achieving optimum economy, and because they found differences in the operational characteristics of the various units, the National Association of Ice Industries with the cooperation of the Calcium Chloride Institute, the Industrial Filter & Pump Manufacturing Company and the University of Texas, sponsored a study to develop the facts on ion exchange for Ice manufacture. Although the project is not complete, it has progressed to the point that general findings are indicated. These findings are listed in the July "Ice News", issued by the Association.

Incidentally, present operators of ion exchange demineralization units are invited to write to the director of the project concerning any operating problems which have been encountered. No attempt can be made to supply direct answers to all such problems but they will be helpful in evaluating the results of the entire experimental program and in the preparation of the bulletin summarizing the results.

The project is jointly sponsored by the Calcium Chloride Institute, the National Association of Ice Industries and the Bureau of Engineering Research. It is under the immediate direction of Dr. W. A. Cunningham, Professor of Chemical Engineering, and two graduate students, Mr. W. C. Mills and Mr. C. A. Rundell, are doing a major portion of the work.

Splendid cooperation has been received from the Industrial Filter and Pump Manufacturing Company, Chicago, which furnished the demineralization unit, the Pure Ice and Food Company, Austin, where the work is being conducted, the Rohm and Haas Company, Philadelphia, which supplied most of the ion exchange resins, and the Dow Chemical Company, Freeport, Texas, which made available a fellowship for Mr. Mills during the 1952-53 school year.

New England Ice Association

RAYMOND WILBUR, Secretary

AFTER consulting with President Hogan and other members plans are under way to hold an association meeting in September — place, dates and other details will be announced later. Those who have ideas or material for discussion are invited to send them to the secretary.

Following the suggestion made at the last meeting, the secretary is endeavoring to interest the locker plant operators in an association that might meet in conjunction with our own group. There are approximately 250 such operators in New England.

The New England President, P. F. Hogan, has been nominated as representatives on the Board of the National Association of Ice Industries to represent the New England group.

Crushed Ice Campaign

READY-to-use-crushed ice is being featured in a house-to-house promotional program by American Service Company of Atlanta. Attractive folders are being distributed by High School Home Economic Girls. Here's how it's done:

(1) Show housewife picture of Bag of Ready-to-use Crushed ice on front of folder. Say to housewife: "You and your family will truly enjoy the sparkling goodness of ways you can use this Ice."

(2) Show housewife inside pages of folder. Say to housewife: "You will be surprised the number of ways you can use this Ice."

(3) Show housewife company name and address on back of folder. Say to housewife: "Here's where you can get Ready-to-use Ice. Buy a bag today!"—Ice News.

Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

NEWS
OPERATING
MAINTENANCE
QUESTIONS -- ANSWERS

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EXECUTIVE OFFICE
435 North Waller Avenue
Chicago 44 • Illinois

THIS MONTH

The refrigerated transportation of perishables in the United States has been developed from the uncertain experiments of the early 1880's to a stable and profitable industry. The growth of this refrigerator car industry and some of its present achievements are told by Leroy Etelz, Superintendent of Refrigeration for the Pacific Fruit Express Company.

NAPRE Chapters report summer recesses from educationel programs; social programs arranged in keeping with the season. Questions on a back pressure valve installation and frosting of liquid lines answered.

Refrigeration on the Rails

Docks for refrigerator cars are on both sides of icing platform. View of outer track during icing operations.

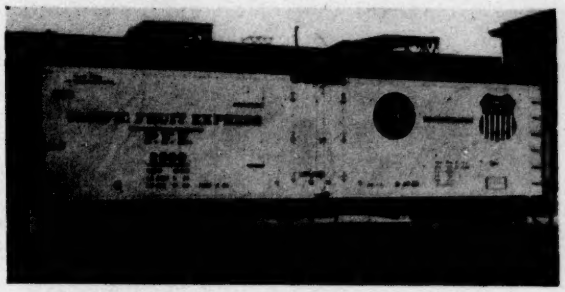
RAILWAY transportation of perishable freight in the United States through necessity has been developed from a weak, uncertain, experiment in the early 1860's to a tremendous stable and profitable national industry. The development of the refrigerator car is most interesting. Most of the early operators and builders of refrigerator cars seem to agree that the Michigan Central Railway is to be given credit for the first attempt at the carriage of fresh meats from Chicago to New York and Boston in a freight car, in which ice was used as a refrigerant.

Early Refrigerator Cars

This experiment had its try-out in ordinary box cars which were fitted up with a platform at each end within the car, upon which the ice was loaded. A suitable means was also provided for catching and discharging the water from melting ice. These improvised refrigerator cars were capable of carrying from two to three thousand pounds of ice, which had to be placed when the car was empty. No means was provided for re-icing in transit and as a consequence they were handled in passenger service as far as Suspension Bridge, New York, where they were made up into fast freights. After a three day's journey, the meats were landed in New York City in good condition.

The Pennsylvania Railroad was conducting experiments in the shipment of perishables at about the same time as the Michigan Central. W. W. Chand-

This paper presented at 43rd Annual NAPRE Convention.



Post-war Refrigerator Car Built and Operated by Pacific Fruit Express Company.

ler was for many years head of Star Union Line, and with Pennsylvania stands forth as one of the leading lights in the development of the refrigerator car. Due to the fact that Michigan Central's experiments did not modify to any great extent the actual construction of the cars, it probably would be more correct to say that the thirty box cars fitted with double sides, roof and floors by Mr. Chandler in 1857 were the real ancestors of the modern refrigerator cars.

So far as is known, these cars were the first in which an insulation material was used. In these cars all the available space in the walls, ends, floor and roof was packed with sawdust. Chandler's cars were constructed with a hole in the floor between the doorways, through which the waste water was discharged. The cars were first loaded and a box containing the ice was inserted in the doorway. An ice box suspended by straps in the end of the car was later installed.

While these experiments were going on there was considerable activity along the lines of better efficiency in car construction in Detroit, and on November 27, 1967, the first patent was taken out by J. B. Sutherland of Detroit, Michigan. In 1868 Mr. D. W. Davis, also of Detroit, patented an improved refrigerator car which became the most widely used. The first shipment of dressed beef was successfully shipped from Chicago to Boston in 1869 in one of the Davis cars. It is the generally accepted opinion that the success of this car was the beginning of the dressed beef industry.

In 1868 Davis tried one of these cars in the shipment of strawberries from Cabden, Ill. The car was fitted with a cylindrical container in each corner of the car in which ice and salt were used as a refrigerant. Such a heavy loss was sustained due to inequality of refrigeration which resulted in the berries near the cylinders being frozen, that shippers did not make another attempt. Michigan peaches were shipped in meat cars to New York the same year and, on account of the heat generated by the ripening fruit, the entire shipment was a loss to the owners.

Shipping of Fruits

Parker Earle of Cabden, Ill., in 1865, made the first attempt at shipping fruits under refrigeration. He constructed chests large enough to accommodate several fruit containers with an ice compartment in each chest. Several of these chests were loaded in a single car. The shipments had to be handled on express train schedules. On account of the damage in handling and the high express rates, the scheme was abandoned although a great measure of success was attained. The shipments of Mr. Earle, so far as is known, were strawberries; however, during that period similar shipments were made from Charleston, South Carolina, by steamer to New York, and in 1877 the first shipment of peaches was made from Georgia.

The accompanying paper was delivered at the 43rd Annual Convention of NAPRE at Dallas, Texas last Fall by Leroy Etzel, Superintendent of Refrigeration for Pacific Fruit Express Company. Mr. Etzel has been a member of NAPRE since 1921 and is at present, Chairman of the Board. He has been a member of ASRE since 1946. A past president of Sacramento Chapter, he has also held offices in California Chapter No. 1. He makes his home in Oakland, California.

Most of the experimental fruit shipments during this period were failures, or only partially successful, since modern re-icing facilities were unheard of, and much might be said about the ripened condition of the fruit when picked for shipment. Several shipments were precooled and the results were somewhat better. Much of the previous trouble can now be attributed to the lack of sufficient ice carrying capacity.

Earle continued with his experiments but procured specially constructed cars known at that time as the Tiffany car, constructed with very large capacity ice chambers. Results improved greatly and the shipment of fruits and vegetables over great distances started beyond all calculations of railroad men of the time. Norfolk, Virginia shipped her first vegetables to New York in 1885. The first shipment of strawberries from California landed in New York in 1888. Oranges from California went East in 1888, and from Florida to New York in 1889. All shipments prior to this date were under ventilation.

It will be seen that this industry started with the carrying of meat, then dairy products followed by fruits and vegetables. More experiments were successful and the idea was practical.

Railroads Become Interested

Up to this time most equipment was owned by private car lines or individuals. In the beginning the railroads, because of the experimental stage of the industry, were not interested in building this type of car. However, they became more interested, and from the turn of the century to the present, railroads have taken the lead in refrigerated car construction and ownership. There are very few privately owned car lines in the field today. Perhaps the more important factor in the railroads' entry was the necessity of providing equipment in the same ratio as the growth and progress of the fruit industry, involving an enormous outlay of capital beyond the financing ability of most of the privately owned car lines. It is obvious that the problem was solved to the greatest satisfaction of grower, shipper, produce dealer and all concerned.

Today, many persons are wondering whether the refrigerator car, as it is now built and operated, will be a factor for a great while longer in the transportation of perishable freight. There has been much publicity on new types of systems which have been developed within the past few years producing mechanical refrigeration automatically to replace ice. There is a very good reason why ice is used, and will be used in the future. It produces adequate refrigeration with proper humidity to prevent shrinkage; is dependable, continues to function in case of train delays; requires no power or attention; and has reserve capacity to quickly cool the lading when loaded directly from the field. This it does at less cost than has been accomplished by any other system, so far.

Pacific Fruit Express

Forty-six years ago small companies were operating refrigerator cars in a more or less haphazard fashion. In 1906 shrewd railroad executives saw the necessity of amalgamation to insure better service and to save needless waste. As a consequence the Pacific Fruit Express Company came into being, owned jointly by the Southern Pacific and Union Pacific Railroads. Its creation was for the protection of perishable shipments moving under refrigeration. During the first year of its existence 48,900 carloads of commodities were handled successfully and marked a big stride in the progress of railroading.

The growth continued steadily until in 1951 the total carloads of perishables moved by the Pacific Fruit Express Company over the network of rails served by it, totaled 434,000 carloads,

consisting roughly of commodities shown in accompanying tabulation.

Naturally, this business necessitated a corresponding growth in rolling stock. From a total of 6,600 cars owned by the Pacific Fruit Express Company in 1907, equipment has been added as demands warranted and at present a total of 38,000 cars are in service. The post-war refrigerator car is virtually a mobile refrigerated storeroom, equipped with side wall flues, floor racks, fans, large doors, half-stage ice grates and easy riding springs. Super-insulated cars are for frozen commodities and chamber a larger load than the standard 40 ft. car. Some "supers" mechanically refrigerated and, to be sure they are maintaining proper temperatures, are checked at regular inspection points.

Ventilated Shipments

Contrary to the general impression, shipments moving in refrigerator service are as frequently billed under ventilation instructions as they are under refrigeration instructions. For this reason the standard refrigerator car must be so built that its hatch covers and ventilators can be opened, directing a current of air through the car and through the load in the car. Under these conditions the ice tanks are empty, but the ventilators must be watched very closely and closed when outside temperatures of 32 degrees or less are encountered. It is also very important that they be opened when the outside temperatures again rise above 32 degrees, so that the load will be ventilated as frequently and as extensively as possible.

To handle perishable loads originating in cold countries or moving through them to consuming centers, a refrigerator car must be so designed that it can be converted into a heater car. This is usually accomplished by placing an automatic alcohol or charcoal heater in the empty ice compartment.

The shipper orders a refrigerator car, if desired, from the originating carrier he selects. The shipper also selects the service he wants his shipment to move under, choosing either "Standard Refrigeration", or "Heater Service", or in some instances, a combination of two of the services mentioned, and in many instances a modification of "Standard Refrigeration" (there are some 65 types of service covered by the tariff).

Standard Refrigeration

Standard Refrigeration consists of initially icing a refrigerator car, after which it is spotted at the shipper's loading shed. After loading is completed, the car is moved to the nearest icing deck where the tanks of the refrigerator car are topped off with ice. The car is then assembled with others and moves on to its destination, being re-iced at all regular icing stations over the route selected by the shipper, as published in the Protective Tariff.

Standard Ventilation, if selected by the shipper, means a car without ice in the tanks will be furnished. After loading is completed, the car moves to destination without icing enroute. Under this service, as in all others, the shipper selects the carriers, the route and specifies the destination and receiver. Heater Service means not only a car furnished without ice in tanks, but that heat will be supplied by carriers at their discretion. The carriers maintain supervisory forces at division terminal points in cold countries to light or extinguish the heaters as desired.

Carloads of Food Commodities Handled by Pacific Fruit Express Company in 45 years of service:

93,500 cars of potatoes
60,000 cars of lettuce
39,000 cars of citrus
21,500 cars of tree fruits
25,000 cars of melons
18,000 cars of grapes
15,000 cars of tomatoes
15,000 cars of onions
17,000 cars of carrots
12,000 cars of celery
24,000 cars of canned goods
12,500 cars of bananas
7,000 cars of frozen foods
9,500 cars of meat products
1,876 cars of beer
2,250 cars of wine

Product Quality

Parallel with the carriers' effort, our shipping and distributing organizations have standardized their products, discarded all fruits and vegetables not properly matured, or defective in any way. They wrap their products in attractive wrappers and pack them in well-built standard sized crates, neatly labeled. The crates are firmly loaded and braced in refrigerator cars and move to consuming centers in almost perfect appearance. The buyer is quite sure his purchase is sound and savory.

The United States Department of Agriculture and our State Departments of Agriculture, together with coordinated efforts on the part of our shipping organizations and our carriers, are gradually improving and stabilizing the perishable freight industry.

NAPRE Department

Cars for New Crops

The Pacific Fruit Express Company is engaged in moving a great portion of perishable products from the Pacific states to Eastern markets. Estimates are constantly being made of acreage planted in different districts and when the crop will mature. A car supply must be made available to move these crops at the proper time. In order to do this a system must be worked out to release cars at Eastern markets, assemble in trains and move back to producing areas. As the cars come to our contract lines they are moved through the various shops that clean, repair and okay them for loading. Surpluses of cars are then built up in the various loading districts so as to be available in quantities large enough to move the crop when it matures. Sometimes market conditions affect loadings and sometimes long hot spells will mature the crop faster than expected, all of which makes the supply of cars that much more complex.

The shipper orders the number of cars he desires, stating the service required. Icing platforms are located adjacent to loading districts so cars ordered may be pre-iced and spotted at the sheds for loading when needed. A major portion of this work is done at night as cars are usually required around seven A. M. when loading begins.

After cars are loaded they are assembled into fruit blocks at central switching points and dispatched on fast schedule. Re-icing stations are furnished with advance information, such as the number of cars, time of arrival and service required so ice may be made available to the train while mechanical inspections are being made by railroad forces.

Platforms range from 12 to 100 car lengths, either of the single or island type. The single deck services cars on one track only while the island platform has a truck on each side and ice is delivered to it through a tunnel and incline conveyor, or from an overhead bridge 24 feet above the track, so as not to interfere with movement of cars to or from the platform.

Platforms are usually 14 feet wide with a reversible conveyor running the entire length; lugs are spaced 5 feet apart and the speed of the chain is 186 feet per minute. This will deliver 37-300 lb. blocks, or 5.5 tons per minute. At times it is necessary to have three or four deliveries at once to handle the volume during prolonged hot spells when fruit or melons are

maturing at a faster than normal rate; some days from 2400 to 3000 tons are issued from the larger plants. Refrigerated storerooms that have been filled during the slack season serve as reservoirs to furnish ice when daily production is exceeded. These vary from 2000 to 51,000 tons capacity.

Facilities are available at icing stations east of the Continental Divide to replenish ice placed around and on top of loads in cars containing certain types of vegetables. This operation is completed during the time inspections are being made by railroad mechanical forces. Body-iced cars are filled with snow ice after loading, which is blown in with machines known as ice slingers or blowers, in amounts varying from 10 to 20 thousand pounds. These machines have a capacity of 40 to 60 tons per hour. Plants vary in manufacturing capacity from 65 to 1160 tons per day. Ice consumption of Pacific Fruit Express Company ran 2,500,000 tons in 1952.

(Early history taken from "Railway Transportation of Perishable Freight." History Development Research by C. A. Richardson of Association of American Railroads, November 1946).

News Notes and Chapter Activities

Los Angeles

FRED HERR

THE June 3 meeting of Los Angeles chapter held in the Terminal Club, featured a talk on vacuum refrigeration of vegetables, presented by Harold P. Hayes, Dean of Engineering, California State Polytechnic College, San Luis Obispo. This talk was arranged by Regis Gubser, California Consumers Corporation, and Herbert N. Royden, Royden Ice Company, members of the educational committee. Professor Hayes and his assistant, Donald Lawrence, the college's instructor of refrigeration, made the 225 mile trip from San Luis Obispo to Los Angeles loaded down with a special projecting machine and other equipment for adequate projection of mathematical formulae and production data slides, with which they amplified their running commentary.

In his remarks, which preceded and accompanied the slides, Professor Hayes described the advances that have been made in vacuum refrigeration of vegetables. The process, he said, is comparatively new, having been attempted commercially only four or five years ago. His sixty minute talk covered such salient points as where vacuum precooling stands today, how it works, and its various applications.

Vern Roberts, assistant chief engineer, Statler Hotel, was given a rising vote of thanks for his efforts in arranging the visit to his hotel's refrigeration and engine rooms, May 20. Rudolph Orduno and Edward L. Armstrong were accepted as members. This brought the chapter's total of new members during the 1953 campaign to 31, W. R. Burnett, membership chairman, reported. This meeting was the chapter's last business and educational session of the first half of the 1953 season. Other events on the June schedule were Old Timers Night on June 17 and the annual golf tournament on June 28.

Rudi F. Kettler, Fairbanks-Morse Company, reported that seven deep sea fishing expeditions have been scheduled between June 24 and September 6. The fishing boat *Kalani*, piloted by Captain Kenneth Hudson, who served the NAPRE fishermen in previous years, has been chartered. The waters of the Catalina Channel between Long Beach and Catalina Island, will be the destination, with Pierpont Landing in Long Beach as the shove-off point. Those waters allegedly teem with barracuda, white sea bass, yellowtail and albacore—unless they read ICE & REFRIGERATION and wisely quit teeming on the days Kettler's gang comes after them. Participating in the June 24 expedition were Rudi and Joe Kettler, Don Clegg, Herbert N. Royden, Amos Eastman, Frank Orr and Ray Smith.

Eccleston Wins Golf Tournament

Frank Eccleston, California Consumers Corporation, again dominated the field in the Los Angeles NAPRE Third Annual Golf Tournament held Sunday, June 28 at the Montebello Country Club, Montebello, Calif.

Frank turned in a low gross of 80, the best score produced by any of the 20 members and guests who participated, making him a three-time winner, having scored low-gross victories in the 1951 and 1952 tournaments.

R. L. Maple, Union Ice Company, compiled an 82, giving him honors as low gross runner-up winner; Jack P. Johnson, Allube Corporation, scored 85 and his 17 handicap brought him down to 68 winning low net honors; William F. Loesch, Frick Company, was runner-up for low net with an 87 and 16 handicap, or a low net of 71. Eccleston's handicap of 12 and Maple's 14 tied for them with Johnson for low net, but having won trophies in other categories, they withdrew from competition.

Another good scorer was Alvin Beack with an 89, who probably would have given Eccleston a closer run for top honors had he not run into trouble when several drives landed in bunkers at the time he appeared to be squaring away to catch Frank on the final nine holes of play.

Three chapter-sponsored trophies and the special Quinn Cup, donated each year by P. T. Quinn, Pacific Fruit Express, will be presented to Eccleston, Maple, Loesch and Johnson at the Ham-and-Beans Dinner in September, marking the chapter's resumption of activities following the summer recess.

Yakima

ELMER TOOP

THE Yakima Chapter has recessed for the summer months, and the next meeting will be held September 9. The May meeting consisted of a trip to Kittitas, Washington, where we made a plant tour at Pictsweet, conducted by Mr. Glenn Leach, manager and member of NAPRE. The plant has both ammonia and Freon compressors for quick freezing corn, beans and other vegetables, as well as storage facilities for potatoes and making ice for the Milwaukee railroad. After a very interesting tour of the plant, the members were treated to a cold buffet lunch and beer by the management.

The fruit industry of Yakima, Washington, is organizing a Civil Defense Program. Secretary Elmer Toop was appointed to the organization committee. The NAPRE Chapter, thru Secretary at Yakima, was asked to furnish technical and engineering information, and suggestions relative to Civil Defense. Mr. Toop is interested in learning whether other chapters than San Francisco have participated in their local programs. If so, he would appreciate learning what your contributions have been and the extent of your assistance. (Ed. note — Ques. No. 949, ICE AND REFRIGERATION, April 1953, deals with one Civil Defense problem; 1953 Operating Data Book will contain more information on this subject.)

Michigan

L. L. ADAMS

THE Michigan Chapter held its last meeting before the summer recess on June 16th at which time Mr. Jack Daniels of Sporlan Valve Co., St. Louis, Missouri talked on "Catch-All" Filter Dryers, using slides to illustrate his various points. In discussing this subject, Mr. Daniels also covered the performance of various types of filters and compared their operation with the "Catch-All" Filter. He also discussed the decomposition or breakdown of oils in the refrigeration systems, water repellency of dessicants, acids in refrigeration systems, and the various means of overcoming these difficulties.

An annual moonlight boat ride was held July 20 in conjunction with the Purchasing Agents Association of Detroit as a mid-summer get-together for the Michigan Chapter. Dancing, contests and various forms of entertainment were enjoyed by all who attended.

San Francisco

LEWIS P. M. BROOKS

AT the regular meeting, May 13, California Chapter No. 1 had as its speaker R. F. Barber, Industrial Engineer, The Foxboro Co. The subject selected was the Dewcel Humidity Measuring Instrument. Our speaker was introduced by Henry Guilmette of the Pacific Scientific Co., who gave a short outline of the progress made in the development of devices for measurement of humidity or dew point.

No attempt was made to cover the subject completely, but some of the important points were mentioned. First, the function of the Dewcel is to determine the temperature at which condensation will occur, or the dew point. Basically, the unit consists of a thermometer bulb (electrical resistance-type or pressure-type, liquid filled), carrying a wick of woven glass tape impregnated with lithium chloride and two silver wires wound on the outside and connected to a source of alternating current.

The behavior of hygroscopic salt in the presence of water vapor is the basis for the function of this instrument. Lithium chloride is the salt used. Since the lithium chloride has an affinity for water, it will absorb moisture and dissolve. This salt has another characteristic which is necessary for the operation of the system. As the salt absorbs moisture it become a conductor of electricity. The resultant current flow generates heat and raises the temperature of the instrument.

As the salt dries out, because of the heat generated, it becomes less a conductor of current thus generating less heat. This process reaches equilibrium when the temperature is reached at which the partial pressure of water over a saturated lithium chloride solution just equals the ambient vapor pressure.

Dewcel measures the equilibrium temperature of the saturated solution of lithium chloride, which is in effect a direct measure of the partial pressure of water vapor over the solution. This pressure is the same as that of the moisture in the ambient atmosphere. Therefore, the instrument can be calibrated to read direct the dew point temperature of the atmosphere. The practical limits of its operation are from approximately minus 20 F to a dew point of 160 F, and a temperature of 220 F. The Dewcel reads directly in dew point, and is readily adapted to long distance indicating, recording, and controlling.

Lecturers and a visitor to California Chapter No. 1, at May 13 meeting. R. F. Barber, speaker; J. J. Budge, guest from Australia. Don C. Bryant, class instructor; Donald Bradshaw, member.

We had a special guest at this meeting, J. J. Budge, Australia, the General Manager of the James Budge Pty, Ltd., Refrigeration Engineers, Alexandria, Sydney. He was in the U.S.A. on a two month coast to coast tour with stops in most major cities for purposes of observing modern refrigeration and industrial techniques. His comment on America was, "Too much food."

New Orleans

LEO J. VIVIEN

NEW Orleans Chapter heard an address on "Trend In Insulation Design of Refrigerated Enclosures" by A. F. Lusch, General Manager of Reilly Benton Company, Inc., local insulation distributor for Owens-Corning Fiberglas Corporation, at their meeting held at the Roosevelt Hotel on the evening of June 10, 1953. Mr. Lusch indicated that efficient and economical performance of insulation in refrigerated enclosures depended essentially on a good design and a well installed job, in addition to the basic requirements of adequate vapor barrier and the selection of suitable insulation material. Mr. Lusch stressed the basic and well known fact that the presence of moisture in insulation seriously impairs its insulation value.

He then went on to discuss the dry wall construction now being pioneered by the Owens-Corning Fiberglas Corporation, and the apparent economical merit in the larger installations utilizing this type construction. A number of slides were shown on this type installation in the Hawaiian Pineapple, Honolulu; Pasco Packing Company, Dade City, Florida; Minute Maid Orange Juice, Leesburg, Florida; and Mid-South Refrigerated Warehouse Company, Memphis, Tennessee plants. This dry wall construction method utilizes Fiberglas PF type materials in large size sheets, 24 x 48 inches, and the wall finishes shown included perforated Masonite hardboard in some plants and a lack of wall finish, with the exception of a wainscoat, in several of the other plants.

Al F. Lusch

At our June 24 meeting, Charles A. Parker, sales engineer for the Minneapolis-Honeywell Corporation, commenced a series of lectures on Automatic Controls. Mr. Parker started the series by lecturing on the reasons for controls, and their proper location. The One-Quarter Club members held another get together in June, but disconnected all controls and had a good time.

John Mariakis and Vernon Foret are very proud of their accomplishments for the ODB. A total of 69 advertisements were turned in by the New Orleans Chapter — 20 full pages. New Orleans renewed 47 ads, and added 22 new advertisers. John and Vernon were actively assisted by Leo Vivien, T. O'Connor, F. Gillio, J. Chaisson, B. Mancuso, F. Chase, M. Sofer and other members, all of whom secured one or more ads.

St. Louis

KEN M. HOLADAY

DELIBERATING in air-conditioned comfort on the hottest evening of the season, June 18, the Executive Committee of St. Louis Chapter launched plans for the 1953-54 program. Roland Hillebrand, Ed Lotte, and Griesedieck Bros. Brewery were hosts to the group, which met for an informal buffet supper in the beautifully decorated and friendly Griesedieck tap room. The meeting was called by President John Dabbs to make committee assignments and to lay preliminary plans for the chapter program schedule, promotion of attendance at the national convention, membership campaign, and active support of the 1954 Operating Data Book project.

Colton

HARRY O. BONTER

FOR the meeting of June 10, members and friends made a tour of the Lucky Lager Brewery, Azusa, California. Reported to be the largest new brewery in the U.S.A., capacity is 90,000 gallons per day and will be doubled when the present construction is complete. Members found it very interesting to follow the course of processing the beer from weighing and measuring the basic ingredients to the bottling, canning, and final shipment via rail and trucks. The invitation was extended by Mr. Vernon Tapogna, Brewmaster. Alfred Pitzl, Chief Engineer, was host. The group enjoyed Lucky Lager Beer before leaving for home.

Rio Grande Valley

ARMIN F. DONEIS

ON May 12, Rio Grande Valley Chapter celebrated a gala occasion combining a housewarming at its newly completed clubroom in the LaFeria ice plant of C P & L Co., the installation of new officers, and the presentation of a testimonial letter to Lon L. Yates, Falfurrias, in recognition of his 32 years of uninterrupted membership in NAPRE. President Doneis called the meeting to order, and after regular business, called for the report of the Auditing Committee, which was presented by Dan Chapman. The books were found in good order.

Past National President, Angus Casberg then gave a report on his lengthy correspondence with the National Office about dues, expiration dates, pro-rata payments, and differences in fiscal years of our chapter and the national organization. After considerable discussion, and some disappointment, it was finally agreed to bring our dues payments in line with the practice of the national office, although some members still felt that the added bookkeeping and red-tape involved the secretary and treasurer in much unnecessary and nonproductive work of a very time-consuming nature. Some felt that dues come payable at a time of year when funds are already extraordinarily low, making collections difficult.

At the conclusion of the official business, the president turned the meeting over to John Muller, program chairman. John began by making acknowledgements in connection with the housewarming and outfitting of our clubroom. He thanked Dan Chapman for furnishing a sturdy oak table, and praised Clyde Young's successful efforts to give it a smooth finish with high gloss. He also pointed with pride to a book cabinet that had been supplied for the beginnings of the Chapter library. A bowl of cut flowers on the speakers table was also acknowledged and the Chapter's charter and some large pictures of various refrigeration compressors on the wall added much to the lived-in appearance of the new quarters.

Mr. Casberg was called upon to introduce the honored visitor of the evening, Mr. Lon L. Yates, La Gloria Corp., Falfurrias, who has had uninterrupted membership in NAPRE for 32 years. In recognition of this distinction, Mr. Casberg officially presented Mr. Yates with a suitable testimonial letter from President Alvis Clay honoring and congratulating him for his outstanding record of membership. In accepting the honor, Mr. Yates related some of his experiences when membership in NAPRE paid off during the long years of operation in isolated localities like his first ice-plant job in Huntington, W. Va., back in 1920. Mr. Yates praised the work of the RGV Chapter and expressed the desire to be considered one of us. He has been a member-at-large.

John Muller introduced several other visitors. Henry Black, Alice, Texas made a special effort to be with us, and was given a warm welcome in recognition of his loyalty to the chapter. Austin Sims of the McAllen C P & L office was praised as a model manager in that he supported and encouraged the work of our organization not only by his interest but also by his presence among us. R. A. O'Neill, a National Director, needed no introduction.

Mr. O'Neill had come down from Corpus Christi, especially for the occasion and to make sure that the newly elected officers were properly installed. "R. A." expressed a deep concern over the apparent indifference on the part of many managements and operating engineers in the Rio Grande Valley over the shortage of truly competent engineers available, and their neglect to avail themselves of the services which our chapter can render in the training and self improvement of their personnel. He reminded his hearers that C P & L Co. has for a long time encouraged the work of NAPRE locally and nationally. He further pledged that for every "non-C P & L-er" on the roster, C P & L would enlist two members from its own ranks.

"R. A." expressed wonder and disappointment in the fact that presently RGV membership consists wholly of ice-plant engineers. He emphasized that a much more healthy and desirable condition would prevail in our chapter if our roster included men from many branches of the refrigerating industry. In such diversity, he said, lies the promise of richer discussion periods and the ready availability of wider experience. He concluded that we should make every possible effort to secure the interest and support of refrigerating men outside the ice-plants.

Coming to the business at hand, "R. A." charged the newly elected officers with the responsibility for faithfully and enthusiastically cooperating to fulfill and achieve the aims and goals of our organization, and declared them properly installed with his approval and blessings: President, Ollie Lee Allbright, Vice President, B. F. Wilson, Jr., Secretary, Armin F. Doneis, Sr., Treasurer, Dan L. Chapman, Sargeant at Arms, Rube C. Keener, and Russell M. Sawyer, Directors, and Instructor, John G. Muller.

After this John Muller announced that a buffet snack and drinks would be served in the adjoining room by courtesy of R. A. O'Neill. While refreshing the inner man, our members and guests enjoyed an hour of good fellowship.

Memphis

CHAS. A. CONLEY

THROUGH the cooperation of John Thrithart, field engineer, General Electric Co., a sound motion picture, "The Shining Rails," was shown at the meeting of Memphis Chapter, June 3. This picture showed the progress of railroad engines to the present date. Two other pictures followed thru the cooperation of E. S. Doland. "Contact" showed the manufacture of types of electrical contactors and their application. "Natural Gas Pioneers" showed the engineering feats of building and operating the great gas and oil pipe lines from the fields to the point of use.

Washington Chapter No. 1

JIM BENNETT

FOLLOWING the May meeting of Washington Chapter No. 1, the group recessed for the summer months. President Chet Bertus planned a good old fashioned family picnic in July for the members and friends of the Seattle Chapter. Tex Cornish was the Chairman of the Data Book Committee. Past president Joe Lester is preparing to open a TV service shop, 2nd Vice President Loren McRae is on a ship wending his way to the Orient, and George Kearney is getting in last minute supplies before heading North. Mort Bell, Supervising Engineer, Sicks Breweries, brought two potential candidates to the May meeting.

N A P R E
Question Box

H. G. Venemann, Professor of Refrigeration, Purdue University and chairman of NAPRE Educational Committee, answers members operating problems monthly in this column. Send questions to Chairman H. G. Venemann c/o Purdue University, West Lafayette, Indiana.

By-Passing of Back-Pressure Valves

QUESTION No. 961: When we enlarged our ice plant in the winter of 1937 we purchased a new 8 x 8 inch compressor, a water pre-cooler, a flash type ammonia liquid cooler, and two back pressure valves. We were instructed to use the back pressure valves on the ammonia and water coolers, and hook all suction lines together into the other three compressors—one York, 9 x 9 inch at 175 rpm, one York 9 x 9 inch at 237 rpm and one Frick 10 x 10 inch at 300 rpm. I did not follow instructions, but bypassed the back pressure valves, and instead of connecting the coils of the ammonia and water coolers into the same line with all of the compressors, I connected them into the suction line of the 8 x 8 inch compressor and operated them at high back pressure without the use of the back pressure valves. Was I right or wrong?—M.J.

ANSWER: It is very difficult to automatically control the temperatures in seven rooms within 3 or 4 degrees F with only two compressors. The design of the system must be very ingenious to control the temperatures within those limits. Each room must be provided with a reliable thermostat, solenoid liquid valve, and thermostatic expansion valve. Pressurestat control would be no good. The load should be carefully distributed between the two compressors.

One of the causes for the temperature in a room to drop after the thermostat has closed the solenoid valve is that the compressor continues to pump out the ammonia in the coils, thus lowering its pressure and likewise its evaporating temperature. Then when the room warms to the point where the thermostat reopens the solenoid valve, there is quite a lag in time before the ammonia has a chance to fill up the coil. In the meantime the room temperature rises some more. Some designs include a gas solenoid valve in the coil outlet from each room which operates simultaneously with the liquid solenoid. This bottles up the ammonia in the coil during its period of inoperation and reduces the temperature fluctuations. Such a system is highly complicated and requires frequent adjustment on the part of the engineer.

A liquid line will frost between the accumulator and expansion valve whenever its temperature is below 32 F. This will occur only when there is considerable "slop over" liquid in the accumulator from the rooms. If there is no "slop-over" from the rooms, or just a little, the liquid within the coil will not get cold enough to frost. Or if it has been frosted it will lose its frost. To prevent the disagreeable effects of dripping water from this line I suggest that it either be insulated or that you hang a drip trough below it, and drain it to a convenient place.—H. G. Venemann.

Frosting Liquid Line

QUESTION No. 962: I have been working in the refrigeration business for a long time and am now working for Swift & Company, at San Juan, P. R. There is a problem that I would like to ask your cooperation to solve. My problem is the following:

This is a cold storage having seven different temperature rooms operated by two 7 x 7 compressors. The room temperatures are controlled by solenoid valves and thermostatic expansion valves. Temperature in rooms are constantly changing from higher to low, from low to higher, and my great problem is that the liquid line extending from the accumulator to the rooms becomes frosted and when it defrosts, all the inside alley or the anteroom becomes wet. This is what I would like to correct, and would appreciate your cooperation in helping me to solve this.

ANSWER: You were absolutely right in operating the water cooler and the liquid ammonia cooler on the 8 x 8 inch machine separately from the other compressors. By so doing you were able to operate it at a higher back pressure than the other compressors and thus affect a saving in horse power per ton of ice. There would have been no saving in horsepower had the back pressure valves been used and all machines connected into a common suction line.

A back pressure valve on a water cooler has the advantage of preventing the water from freezing but the presure at the machine is not effected because the gas pressure drops while passing through the valve. It is the suction pressure at the compressor and not in the coil which influences the horsepower. — H. G. Venemann.

New Questions

Quick Freezing Turkeys

QUESTION No. 963: We are building a blast freezer tunnel for quick freezing eviscerated turkeys at a desired room temperature of -45 to -50 F. We have two vertical ammonia compressors with displacements of 153.4 and 134.6 c.f.m. respectively,

NAPRE Department

and one rotary booster having a displacement of 659 c.f.m. We contemplate using two air units each having 8000 square feet of fin coil surface, and each having a blower of 25,000 cfm capacity. The coils will be made up of ¾ inch steel tubing—3 fins per inch. They will be flooded at all times by means of a liquid recirculating system. (1) We would like to have the ratings of the booster compressor at -55 F and -60 F evaporating temperatures and at 15 and 20 psig. discharge pressures. (2) We would like to have the ratings of the vertical compressors at 15 and 20 psig suction pressures and at 155 and 175 psig discharge pressures. (3) We would like to know whether in your opinion the two air units will be adequate to take care of the load.—W.H.J.

Mercury Column Manometers

QUESTION No. 964: The relative safety of Mercury Column Suction Gauges was brought up for discussion because several members had heard or read about disastrous explosions attributed to such gauges. Any reliable information as to the cause and effect, and the chemical reaction created by the combination of mercury and ammonia or lubricating oil would be helpful to us.—A.F.D.

California Poly A Practical College

FOR years the NAPRE has helped to develop many outstanding refrigeration engineers. Some of these men are now designers, others are plant superintendents, others are operating engineers. But they all have one thing in common—they started with basic skills on the job, learned fundamentals through NAPRE classes, learned applications through guest speakers at NAPRE meetings, and applied what they learned to their own respective jobs. Throughout their careers they have concentrated on practical applications — they have learned by doing.

Surprisingly enough in this day of emphasis on theory and research in colleges, there is a school in California which closely follows the NAPRE practical approach to education. California State Polytechnic College, San Luis Obispo, offers an engineering degree (Bachelor of Science) in air conditioning and refrigeration based upon the following principles: One, all students must first learn how to use the tools of the trade. They must learn drafting, welding, sheet metal operations, and piping codes and assembly in their freshman year.

Two, they must learn how to operate, maintain, repair, and test refrigeration equipment; three, they must not only learn basic fundamentals of engineering and science, but they must also learn how to apply this knowledge to practical problems in the field; four, they must, by the end of their fourth year in college, be able to plan complete refrigeration and air conditioning systems, make the necessary drawing, and do the actual installation work; five, throughout their four years in college they must study other courses which help them to become well adjusted individuals and good citizens.

Refrigeration and air conditioning laboratory, California Polytechnic.

Most engineering colleges insist upon a very rigid pattern of high school subjects as admission requirements. Cal. Poly believes in giving students a chance to demonstrate

their ability even though they may not have taken certain subjects in high school. Any student who shows promise of being able to succeed in college will be given the opportunity to try. Of course, the College makes use of various aptitude tests and performance records of applicants to make certain that the applicant really is good college material.

Because of its practical approach to education, Cal Poly welcomes men who, after working for a while in the refrigeration industry, decide to return to school to study for an engineering degree. Although experience cannot be substituted for college credit, it is possible for a student to *challenge* any course which contains material in which he feels especially qualified by virtue of previous experience. If the student successfully passes a challenge examination, he is not required to enroll in that particular course as a graduation requirement. Thus excellent welders, sheet metal workers, or mechanics, are not forced to repeat a very large portion of the total course requirements, but time saved can be put to good advantage elsewhere.

One big advantage of this practical approach (sometimes refered to as the upside down approach) is that students who drop out of college have something other than mere theoretical knowledge to show for the time they spent. Because theory and application are so closely integrated at Cal Poly, at the end of every school year the student can point to specific types of work for which he has become qualified. Other advantages are that the work is always closely related to industrial practices, the student's interest is kept high because he can see the practical value of what he is studying, and he very soon becomes qualified for part time work where he can earn while he learns.

The Air Conditioning and Refrigeration Department granted its first bachelor of science degree in 1948. Since then there have been a total of 127 graduates. Ninety percent of these graduates have remained in the field of air conditioning and refrigeration, being employed in operation, maintenance, installation, sales, planning and production.

Motor Enemies May Make Triple Trouble

ELECTRIC motor manufacturers are quick to point out that of eight or nine motor enemies, dusts, stray oils and water vapors are the three ringleaders. Together they spell triple trouble illustrated below.

These motors were looked at regularly and a routine cleaning schedule was followed. However, the look wasn't far enough and the cleaning schedule was not implemented with proper procedures and efficient cleaning equipment. The maintenance schedule didn't take into consideration the motor's environment. Hot greasy, food-product vapors in the air were overlooked, and free dust from a grinding process, also.

The motor pictured is an 800 hp, 220 v, 60 cycle, 100 percent power-factor, 1200 rpm unit, and drives a centrifugal refrigeration compressor for an air conditioning system. It draws 6,740 amperes in starting, on an-across-the-line arrangement or hook-up. Installation was made slightly less than four years ago.

Repairs, including a new stator and coils, plus cleaning and refinishing the rotor will cost the owner just under 5,000 dollars. A new frame is also being supplied by the manufacturer for a few hundred dollars additional cost. A new motor would have been 9,500 dollars!

Have you cleaned your motors lately? If you haven't, it is a good idea to do it right now. Do you have a regular schedule for checking your motor's cleanliness? If not, better make an appropriate schedule for your plant, get started on it and stick to it.

For a few ideas, readers are referred to "Preventative Maintenance for Electrical Equipment," ICE AND REFRIGERATION. October 1951, and "Do's and Don'ts of Electrical Maintenance around Refrigerating Plants" in NAPRE Operating Data Book, 1951.

Canadian Refrigerator Car Passes Test

A NINE-DAY attack on summer heat was successfully concluded when the Canadian Pacific Railway's mechanical refrigerator car No. 282400 pulled into Montreal from the west coast with almost 43,000 pounds of frozen halibut aboard. The operation was a joint test conducted by the C.P.R. and Canadian National Railways in cooperation with the National Research Council, and was termed by railwaymen the most successful yet. This refrigerator car is designed to carry all types of loads which require protection, either by cooling or heating in the range from 10 degrees below zero to 65 F in outside temperatures ranging from 40 below to 110 degrees above.

When the fish was loaded in Vancouver it registered approximately 15 degrees above zero and the thermostat controlling the temperature inside the car was set at minus 10. During the cross-Canada trip the car passed through temperatures ranging from 46 to 87 degrees, but when the fish was unloaded in Montreal it was registering a cool nine degrees below.

Two views of 800 hp synchronous motor which failed because of improper maintenance and cleaning procedures.

Refrigerated Warehousing Industry

NATIONAL ASSOCIATION of REFRIGERATED WAREHOUSES

Division of American Warehousemen's Association

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THIS MONTH IN BRIEF

Cold storage holdings for June 30 showed an above average occupancy for this time of year, with 63 percent. Cooler occupancy had about the same as last month and freezer occupancy increased slightly.

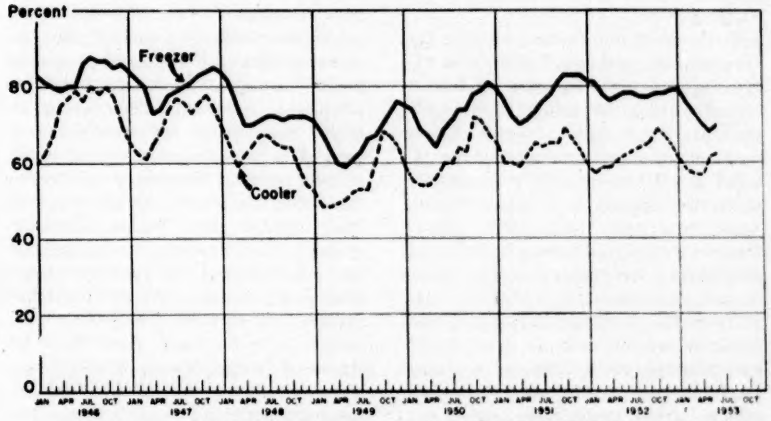
Production of peaches in the United States has been increasing rapidly in recent years, which has accentuated the problem of harvesting and handling and finding profitable markets for the crops. This problem cannot be met wholly by refrigerated storage, except for short periods to carry them over a glut in the market. However, other phases of refrigeration are of value such and precooling and cooling in transit.

The freezing and handling of frozen fish has become a major Northwest industry. To provide needed facilities, the Port of Seattle has completed a new three-story cold storage plant at its Spokane Street Terminal with storage capacity of 3,600 tons.

June 30 Cold Storage Holdings

STORAGE holdings of creamery butter and American cheddar cheese each reached new record highs according to a tabulation of refrigerated warehouse reports received by the U. S. Department of Agriculture for the month ended June 30. Butter stocks totaled over 253 million pounds while American Cheddar cheese holdings totaled over 339 million pounds. stocks by more than 10 percent. Beef and pork stocks each totaled less than the amount in store last year yet holdings of beef were still above average for June 30.

June 30 occupancy in public cooler space was above average for this time of year despite a less than average increase from May to June. With an occupancy of 62 percent, cooler space



END OF MONTH OCCUPANCY OF PUBLIC COLD-STORAGE WAREHOUSES, 1946-53

Holdings of shell eggs, on the other hand, were at a new record low for June 30 with only 1.5 million cases reported in storage. June 30 stores of frozen poultry were about average for this time of year but were under the June 10, 1952 stocks. Frozen fruits in store were about 25 percent under those of last year, but stocks of frozen vegetables exceeded June 30, 1952 utilization was about equal to the June 30, 1952 level and compares with 61 percent for this time of year in the 5-year average period ended 1952. The rise in cooler occupancy was evidenced in the East and West North Central States, South Atlantic and Mountain regions. In other areas occupancy declined slightly or was unchanged from the previous month. An

TABLE 1—COLD STORAGE HOLDINGS IN PUBLIC, PRIVATE AND SEMI-PRIVATE WAREHOUSES, APPLE HOUSES AND MEAT PACKING PLANTS (000 LBS.)

	June 1953	May 1953	June 1952	Five Year Average
Beef	177,504	194,617	189,753	99,422
Pork	407,446	459,755	685,033	545,771
Other Meats and Meat Products	156,083	164,030	154,551	121,217
Frozen poultry, lbs.	117,687	123,485	174,040	116,595
Creamery butter, lbs.	253,003	193,609	68,616	96,431
American Cheese, lbs.	339,062	279,886	192,920	181,522
Other cheese, lbs.	24,209	22,105	19,655	21,205
Shell Eggs, cases	1,523	1,431	3,357	3,482
Frozen eggs, lbs.	159,683	132,294	166,419	195,641
Applies, bu.	597	1,377	282	372
Frozen fruits, lbs.	180,563	130,636	246,185	234,778
Frozen vegetables, lbs.	380,611	361,217	336,911	252,847
Frozen fish, lbs.	141,790	113,581	152,396	122,242

TABLE 2—PERCENTAGE OF SPACE OCCUPIED BY PUBLIC COLD STORAGE WAREHOUSES (APPLE HOUSES EXCLUDED)

	Net Piling space (000 cu ft)		April 1953 (%)		May 1952 (%)		May 1953 (%)		5 year average (%)	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	3,204	6,943	47	61	48	61	40	72	46	66
Middle Atlantic	31,752	37,573	52	70	52	66	54	79	52	68
East North Central	28,206	26,622	74	81	71	79	73	80	73	72
West North Central	8,514	19,756	76	80	74	80	73	87	72	80
South Atlantic	8,917	13,632	65	64	59	66	64	83	65	77
East South Central	2,160	3,196	84	82	85	81	86	94	80	88
West South Central	7,291	8,800	73	74	73	72	68	65	67	62
Mountain	1,211	2,948	48	56	46	62	71	77	64	69
Pacific	16,269	29,274	48	59	50	55	48	71	47	64
United States	107,524	148,744	62	70	61	69	62	78	61	70

increase in utilization of freezer space brought national use up to 70 percent which was about average for June 30. Last year, however, national use was as high as 78 percent. In all regions except New England, West North Central, South Atlantic, and Mountain, freezer occupancy was up from 1 to 4 points while in the aforementioned areas occupancy was either unchanged or was down from the May 31 utilization.

Both cooler and freezer weights increased during June. The former increased 6 percent to total 1.2 billion pounds while the latter increased 5 percent to 2.1 billion pounds. There was a general net into-storage movement for all cooler-hold commodities with the exception of fresh apples, pears, beef, pork, and canned meats. Dairy products particularly reflected the sharpest net gains. The only freezer-held commodities reflecting net withdrawals were poultry, meats and juices which, collectively, were offset by seasonal storage gains in dairy products, eggs, fruits, vegetables, and selected meat items. The largest reported gain was in butter holdings which were followed closely by the increase in frozen fruits.

Although June 30 holdings of frozen fruits in the amount of 181 million pounds were about one-fourth under holdings last year and average June 30 stores, the June net gain of 50 million pounds was one of the largest on record for this time of year. With the exception of frozen peaches, of all the other frozen fruit items were not only below their respective June 30, 5-year average level but also were below the amount in store last year. June net withdrawals from storage for most frozen fruit items ranged from only slight reductions to 4 million pounds while net gains in storage stocks were limited to the following fruit items: Blackberries, Young, Logan, and Boysenberries and strawberries.

Frozen vegetable stocks were up to 381 million pounds on June 30—a gain of only 19 million pounds over the previous month's total. The only vegetable items reflecting a June net gain were frozen asparagus and frozen peas. The former increased 7 million pounds to almost 20 million, while the latter commodity reflected a stock gain of 29 million pounds to reach 95 million pounds. Holdings of all frozen vegetable items with the exception of lima beans, snap beans, brussels sprouts, corn, and peas, were greater this June 30 than last year and in almost every instance stocks of the individual items were above their respective 5-year average level. June 30 stores of frozen orange concentrates were off almost one million gallons from the previous month's total. National holdings totaled slightly more than 23 million gallons which compares with almost 28 million gallons last June 30 at which time an increase of more than one-half million gallons was reported.

All previous storage records for butter were eclipsed this June 30 as stocks reached 253 million pounds. This quantity exceeded the previous all-time records high (August 31, 1950) by almost 14 million pounds.

American cheddar cheese holdings also reached new record levels with 339 million pounds on hand June 30. The previous all-time high was 292 million pounds reported September 30, 1952. The net into-storage movement of American cheese since May 31 was a little more than 59 million pounds compares with an average June increase of 33 million pounds and 28 million pounds last year.

National holdings of shell eggs were only 1.5 million cases on June 30—a net increase over the previous month of only 92,000 cases. Current sales of shell eggs were the smallest June 30 on record. Storage holdings of frozen eggs increased 27 million pounds during June to total almost 160 million by the end of the month. Stocks were aboue one-fifth under average and four percent under last year's total.

The June net withdrawal of frozen poultry from storage was only half as much as average and the net withdrawal last year. The 6 million pound reduction brought total stocks down to about 118 million pounds. Last year poultry holdings weer over 170 million pounds while average holdings for June 30 was 117 million pounds. Yet, all poultry items, except broilers, roasters, and fowls, were above average for June 30.

National refrigerated stores of beef were down to 178 million pounds by June 30—a net reduction of 17 million pounds since the end of May. This net withdrawal compares with 24 million last year and 14 million during June in the 5-year period ended 1952. While holdings of beef were under those of last year by 12 million pounds they exceeded by 78 million pounds the average June 30 stores. Holdings of pork, on the other hand, were not only under last year's total

TABLE 3—PERCENTAGE OF SPACE OCCUPIED BY PRIVATE AND SEMI-PRIVATE REFRIGERATED WAREHOUSES AND MEAT PACKING

	Private and Semi-private Warehouses						Meat Packing Establishments					
	Net Piling Space (000 cu ft)		Space Occupied—percent June 1953		June 1952		Net Piling Space (000 cu ft)		Space Occupied—percent June 1953		June 1952	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	—	—	—	—	50	50	—	—	—	—	—	—
Middle Atlantic	1,499	1,428	51	34	21	63	719	240	94	76	68	85
East North Central	3,009	5,216	72	50	69	61	2,603	838	80	71	91	64
West North Central	240	1,157	46	46	78	78	5,267	3,770	81	82	87	98
South Atlantic	56	7,322	66	62	13	72	—	—	—	—	100	100
East South Central	—	—	—	—	—	—	67	61	100	90	100	100
West South Central	—	—	—	—	53	97	294	160	100	100	100	100
Mountain	369	386	50	50	44	—	353	260	100	100	89	100
Pacific	1,733	5,445	39	42	17	59	746	253	83	92	88	96
United States	6,906	20,954	56	53	35	66	10,049	5,582	84	83	87	93

NOTE: Blank spaces indicate that insufficient returns were received.

but were under average as well. June 30 stores totaled 407 million pounds which compares with 685 million in 1952 and 546 million on hand this time of year in the 5-year average period ended 1952. The June net disappearance was over 52 million pounds which was almost 70 percent greater than average and more than one-fifth greater than last year.

Storage Outlook

The rise in cooler occupancy reported during June may continue into July. Although there is evidence by previous performance to indicate no change in cooler occupancy from June 30 to July 31, because of the significant amounts of cheese now moving into storage, an increase of at least 1 point over the June 30 occupancy is not unlikely at this time. Freezer utilization increased during June as expected but in an amount less than average. Freezer occupancy should continue on its upward cycle during July and may increase by as much as 2 points. Much will depend, however, upon the volume of frozen fruits, vegetables, and butter which will be moving into storage during July and upon the net withdrawals of juices, poultry, and meats which could offset any potential increase in freezer occupancy.

Summary of Regional Cold Storage Holdings

THE sixth in a series of annual summaries of cold storage holding has been issued by the Production and Marketing Administration of the United States Department of Agriculture. In this survey, end-of-month stocks of various commodities are listed according to their geographic distribution. Data for this report were collected from public, private and semi-private warehouses with specialized warehouse facilities such as fruit houses and meat-packing plants. Copies may be obtained from the Production and Marketing Administration, U. S. Dept. of Agriculture.

New Egg Products Law

A NEW egg products law in California will be of interest to refrigerated warehousemen in that state. Under the old law egg product firms were required to have a state license for each place in which they did business including warehouses where their products were stored. The new law requires only one license and will therefore give these firms greater freedom of the facilities offered by California warehousemen.

New TRRF Research Projects

THE Scientific Advisory Council of The Refrigeration Research Foundation has endorsed and approved two new research projects.

Frost Heaving

Frost Heaving in Soils Adjacent to Refrigerated Spaces will be conducted under the leadership of Prof. R. C. Jordan, Head, Department of Mechanical Engineering, University of Minnesota. Justification lies in its general objective of lower cost and greater assurance of protection against frost damage in the new one-story structures that are becoming so prominent in the refrigerated storage industry of today.

Ventilating and soil heating devices are very expensive; they may not be needed or may be needed in certain localities, but not in others. Perhaps unsealed, uninsulated floors which permit moisture vapor to rise through the floors without obstruction, are the answer, again in certain locations. A number of the industry's outstanding engineers have recommended the project and have recommended the University of Minnesota as a suitable institution for the study. Once the relationships of soil type, soil water, climate, floor structure, etc., are established, it may be possible to reconstruct damaged floors less expensively and more effectively, as well as construct new floors.

Measuring Humidity

Development of an instrument for the measurement of humidity in refrigerated storage rooms, to be conducted under the leadership of Dr. C. W. Thornthwaite, Professor of Climatology, Johns Hopkins University. Here the objective is better operation of the nation's great freezer storages, which are increasing in volume each year.

Those who follow the research frontier in refrigeration, realize that high humidity in freezers, the highest possible, reduces the burden on packages in the prevention of removal of moisture from products. A necessary tool is the best instrument possible for the measurement of relative humidity in freezers.

The Foundation has supported a project with this objective at Northwestern University over a period of years, and it has succeeded in evaluating existing instruments and in defining the intricacies of the problem of instrumentation. In fact, that project has exceeded the provisions of its plan.

Dr. Thornthwaite has had extensive experience in what is called

"microclimatology" — the measurement of temperatures and humidities and their variations within confined areas such as buildings and storages and is thus well qualified for further pursuit of this objective. Both of these projects were scheduled to start in July 1953.—TRRF Information Bulletin.

Traffic Managers Study Truck Congestion

TIME loss in the movement of perishables because of truck congestion at loading docks is a problem which has been getting close study by the traffic managers of refrigerated warehouses in Chicago. A study by a special committee of these traffic managers shows that failure to either obtain or supply information on truck arrivals was the largest factor causing congestion at docks.

To help alleviate the problem the committee has approached truck operators with a four-point program calling for: (1) trucking companies to furnish a schedule of truck running times from the points having the heaviest movement with which the warehouses are concerned; (2) advice of shipments moving to warehouses before trucks reach their destination; (3) calling the warehouse when loads coming to the warehouse are at trucker's yard or dock and give aprange a definite loading time for outgoing shipments.
proximate time of delivery; (4) calling warehouse ahead of time to ar-

If the committee is successful in getting the truckers to adopt this plan it should go a long way toward alleviating a bad situation and be of real value to both truckers and warehousemen.—Cold Facts.

Canadian Fish Industry Needs Cold Storage

LACK of cold storage facilities is one of the greatest difficulties facing the Canadian fishing industry, Fisheries Minister Sinclair of New Brunswick told a group of southern New Brunswick fishermen at Saint John, on June 17.

Public cold storage plants were being built through funds supplied by the National Harbours Board and Industrial Bank loans supplemented by Canadian Government subsidies, he said. In some cases, "outright gifts" of $10,000 were extended to fishermen's co-operatives which made the freezing facilities available to the public.

The Storage and Handling of Peaches

PRODUCTION of peaches in the United States has been increasing rapidly in recent years. This increased production, amounting to more than 80 million bushels in some years, has accentuated the problems of harvesting and handling the crop and finding profitable markets for it, according to a study made under the Research and Marketing Act by the United States Department of Agriculture.

As regards storage of peaches, the study points out that at cold-storage temperatures peaches deteriorate rather rapidly in dessert quality and soon lose their ability to ripen even when transferred to room temperatures. Consequently, peaches are seldom stored, and then only for short periods to carry them over a glut in the market, or to extend the handling season for processing. The effects of low temperatures on fruit ripening are also of interest from the standpoint of precooling and refrigeration in transit. The storage quality of peaches is determined largely by their resistance to mealiness and breakdown at low temperatures, whereas the shipping quality is related to resistance to bruising and injury during handling. This is determined largely by firmness of the flesh, toughness of the skin, and rate of ripening.

Ripening Retarded

It has been observed that storage at 40 and 50 F. retarded ripening but permitted normal changes in peaches so that good quality was attained, whereas at 32F normal ripening and softening was prevented so that fruit ripened to poor quality. Another report states that the optimum storage temperature for four varieties of peaches grown in Florida was 42F. They stated that temperatures below 40F were unsatisfactory because of darkening of the flesh. However, the only temperature below 40F used by them apparently was 37F. Except for the reports that have just been mentioned, all other investigators show that the storage life of peaches is longer at the lower temperatures of 30 to 33F.

Partial ripening at room temperature (delayed storage) has been shown to affect certain physiological low-temperature disorders of apples, and it might be expected to influence the low temperature breakdown or mealiness in peaches also. Three varieties of peaches were held at 70 to 90 F. for 12 to 18 hours before storing them at 34 to 36F, but the delay materially shortened the storage life of the fruit. In South Africa, Elberta peaches were held for 1, 3, 6 and 9 days at room temperature before storing at 34F. Pre-ripening for 3 days improved the quality as compared with either shorter or longer pre-ripening periods.

Because peaches are harvested in the summer when prevailing outside temperatures are high and since they ripen rapidly and soon become very soft at these high temperatures, it is very important that they be cooled as rapidly as possible in order to keep them firm enough for handling without bruising during their marketing period. Peaches are very subject to decay during ripening, and the development of decay is much more rapid at high temperatures.

Softening Retarded

Therefore, precooling and refrigeration in transit are used to retard softening and also as a means of regarding decay development. Although decay on peaches arriving at terminal markets may be less because of refrigeration in transit than on peaches not refrigerated, this does not mean that refrigeration has controlled the decay. Refrigeration does not kill the decay organisms, but only retards their development. Upon arrival of peaches at the markets, the organisms renew their development—and the development continues during subsequent ripening of the fruit.

A number of methods of precooling peaches have been used. These may consist of (1) circulating the car air through the cooling coils of a mechanical refrigerating unit mounted on a truck (portable precoolers), (2) circulating the car air through the bunker ice (to which salt is usually added at the rate of 3 to 5 percent of the weight of ice in the bunkers), and (3) cooling the fruit by a flood of ice water (to which a germicide may be added).

Precooling by circulating the car air through the bunker ice may be accomplished by temporarily installing fans in the upper bunker opening, or in the case of fan-type cars by using the fans permanently installed in the cars. In the latter case, an electric motor or gasoline engine is attached to the fan shaft on the outside of the car. With either of these methods it is customary to reverse the normal direction of air flow due to convection currents so that the top of the load tends to cool as fast as or faster than the bottom the load.

Trucks for Short Runs

In hauling peaches, trucks are used primarily for short runs. Although these trucks are usually refrigerated, the effectiveness of thé refrigeration in peach shipments has not been investigated. With short hauls of 24 hours or less there is little need for refrigeration unless the peaches are of advanced maturity or ripeness or are especially subject to decay. Reports have been made on truck shipments in which the top of the load was covered with a layer of snow ice blown over the load to a depth of approximately six inches. No temperature records or detailed data on the condition of the fruit were presented, but it was indicated that ripening and decay were retarded and that there was less bruising. It was stated that the wetting of the baskets and fruit was not objectionable to the receivers.

Measuring Humidity in Refrigerated Storage Rooms

DEVELOPMENT of an Instrument of Humidity in Refrigerated Storage Rooms is to be conducted by the Refrigeration Research Foundation under the leadership of Dr. C. W. Thornthwaite, Professor of Climatology, Johns Hopkins University. Here the objective is better operation of the nation's great freezer storages, which are increasing in volume each year.

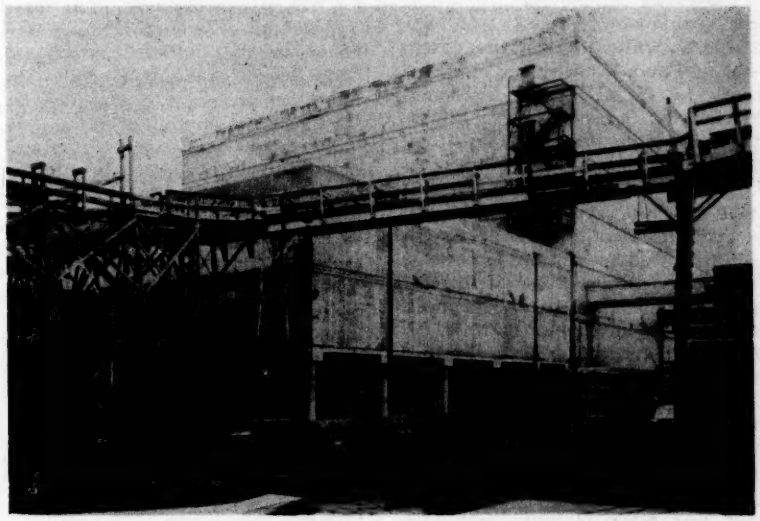
Those who follow the research frontier in refrigeration, realize that high humidity in freezers, the highest possible, reduces the burden on packages in the prevention of removal of moisture from products. A necessary tool is the best instrument possible for the measurement of relative humidity in freezers.

The Refrigeration Research Foundation has supported a project with this objective at Northwestern University over a period of years, and it has succeeded in evaluating existing instruments and in defining the intricacies of the problem of instrumentation. In fact, that project has exceeded the provisions of its plan. Dr. Thornthwaite has had extensive experience in what is called "microclimatology", the measurement of temperatures and humidities and their variations within confined areas such as building and storages and is thus well qualified for further pursuit of this objective. This project was scheduled to start in July, 1953. —TRRF Bulletin.

Port of Seattle Adds New Fish Cold Storage

DUE to the population increase in the Pacific Northwest in past years, together with the recently improved methods for the freezing and handling of frozen fish for shipment to the East, the storage of frozen fish is fast becoming a major Northwest industry, according to E. H. Savage, President of the Port of Seattle Commission. In order to keep abreast of that industry, Mr. Savage said, the Port of Seattle last winter began construction on a new, three-story cold storage plant at its Spokane Street Terminal.

This plant, which consists of a 100-foot by 147-foot, reinforced concrete structure, is virtually completed and is already being utilized to near capacity for fish storage. Capacity of the new unit is 3,600 tons. The first floor of the building consists of four refrigerated rooms and a refrigerated corridor to the fish-handling house, as well as a through-traffic corridor.



Outside view of new three-story addition to cold storage plant of Port of Seattle. The overhead runway is an ice conveyor which carries ice to refrigerator cars. In the background is the original seven-story cold storage plant.

The second and third floors consist of four refrigerated rooms each. Insulation in the structure is of five and six inches of cork on the floors and walls and eight inches on the roof. Two four-ton capacity elevators will speed operations greatly. All of the rooms in the new warehouse are designed to be operated at minus 10 F.

Views in the New Fish Cold Storage Plant, Port of Seattle. 1. Transferring frozen halibut into crates for storage. 2. Through traffic corridor. 3. Loading truck. 4. Loading platform.

Contractor for the building, which cost approximately $470,000, was Noble W. White. Refrigeration design was by Frank Knowles and electrical work by B. A. Travis Associates. Herbert W. Parish is general superintendent of the Port's Spokane Street Terminal.

"We of the Port Commission feel that this new structure will fulfill a great need in the community. In addition, we expect that the upsurge in the frozen fish business will result in this new facility operating at peak capacity at all times," said C. H. Carlander, Secretary of the Port of Seattle Commission.

In addition to this new plant, the Port operates a cold storage plant at the Bell Street Terminal, pier 66. This is a one-story concrete building, combination cold storage, a general storage, and office building. The cold storage department has 646,000 cubic feet capacity, with four elevators; the general storage, with 32,800 square feet and one elevator; and an office floor with 24,600 square feet.

Floor Construction

A letter recently received from L. L. McCoy, chief engineer, City Products Corporation, St. Louis Division, St. Louis, Mo., bears a close relationship to the new TRRF-aided project on frost heaving and contains just the kind of information needed in the survey phase of this project.

Mr. McCoy states that his corporation considers the subject very important. For many years, in multistory buildings, they put freezers on top floors wherever ceiling or roofs could be adequately insulated. In Arizona, they recently built ground-floor freezers on fills of about 3.5 feet of volcanic cinders with 6-inch vitrified-tile lines running through the cinder fill on an incline to assure drainage and induce air circulation. The ground is so warm and dry there that close spacing was not deemed necessary.

In their construction of a hardening room recently in St. Louis, they were forced to install lead-sheathed heating cables, because adjoining buildings prevented use of tile. Each of two cables serpentined on the ground beneath the insulated floor supplies about 5,000 Btu per hour and heating is supplied on Sunday to level off power demand. "We guess (you can't figure it) that one day a week will keep frost from forming." He goes on to say that the floor problem now takes guessing and imagination.—TRRF Information Bulletin.

Resolution Approves Uniform Commercial Code

THE position of the National Association of Refrigerated Warehouses on the Uniform Commercial Code is well stated in the following resolution, which was presented by the Executive Committee on the floor of the recent annual convention and was unanimously adopted. It was prepared by the Committee on the Uniform Commercial Code, headed by Earl Hess, who had given long and careful study to the subject. The code is already law in Pennsylvania and has been introduced in the legislatures of several other states.

Resolution

WHEREAS, long continued study by a special committee of the National Association of Refrigerated Warehouses of the proposed commercial code has been made, and;

WHEREAS, this Committee has determined that the so-called Uniform Warehouse Receipts Act is not of uniform tenor in all of the States in which passed, and;

WHEREAS, the Committee finds that decisions by courts under the Uniform Warehouse Receipts Act have diverted the uniform tenor of the Act, and;

WHEREAS, the National Association of Refrigerated Warehouses believes that the uniform commercial code not only cures the diversity of decisions under the Uniform Warehouse Receipts Act, but is otherwise an improvement;

Therefore, Be It Resolved: That the National Association of Refrigerated Warehouses approve the uniform commercial code as submitted by the National Conference of Commissioners on Uniform State Laws, for introduction in the various State Legislatures, in the full belief that its passage will in no manner injure the Refrigerated Warehouse industry.

New York State Assn. Annual Meeting

A PROGRAM of speaking and panel discussions was given at the 40th annual meeting of the New York State Association of Refrigerated Warehouses held at Rochester June 10-11.

A feature of the meeting was an address by Cornell University's Dr. Harrell DeGraff, who pointed out dramatically the impact of refrigerated warehousing on present day food diets. His comment—"Our present day diets have changed radically from those of a few years ago. More and more processing of foods is demanded of the consumer . . . as we increase the intake of this highly-processed diet (perishable foods), the services of your industry are called on more and more."

Officers were re-elected as follows:

President: Garth Shoemaker, Elmira.

Vice Presidents: Wes Rider, Germantown; Richard Doncaster, Holley.

Secretary: W. M. Scott, Rochester.

Treas: R. C. Stokell, Brooklyn.

Directory of Refrigerated Storage Warehouses

A DIRECTORY of refrigerated warehouses has been compiled and issued by the Production and Marketing Administration of the United States Department of Agriculture. The refrigerated storage warehouses listed in this directory are facilities that are artificially cooled to 50 F or lower wherein foodstuffs are generally stored for 30 days or more. This includes all types of storage business having refrigerated storage space, public, private, semi-private and meat packing. Food packers and processors are also included if they have refrigerated storage space for holding their product and products are generally held for as long as 30 days. Not included are facilities owned by wholesalers, jobbers or retailers who use their storage space for holding products less than 30 days. Nor are facilities listed that belong to the armed services or are a part of a hotel or similar establishments.

To present the data in this publication in the most usable form, the States are arranged alphabetically, as are the cities within states, and warehouses within cities. Immediately preceding each State listing is a table giving total net refrigerated warehouse capacity, by temperature range, for each type of warehouse classification. In no case are data presented for a warehouse classification or State in which fewer than three warehouses are represented or in which individual operations would be revealed by publication of the data.

Frozen Fruit Shipped

USING mechanical refrigeration, the Santa Fe recently highballed a carload of frozen fruit across the country in perfect shape. Below zero temperatures required for the solid freezing were easily and uniformly mintained. The load weighed 126,000 pounds, quite a contrast to the 30,000 to 35,000 pound loads of fresh fruit and vegetables.—Produce News.

Mid-Year ASRE Meet Draws Record Attendance Conferences and Technical Sessions

THE mid-year meeting of the American Society of Refrigerating Engineers held at the Lake Placid Club, New York, June 28 to July 1 attracted a record-breaking attendance of nearly 700 members and guests. The Lake Placid Club provided an attractive setting, a place for relaxation amid beautiful surroundings.

The program consisted of papers and discussions covering a wide range of engineering and technical subjects, conferences on domestic refrigerants and residential air conditioning, committee meetings and a full program of entertainment.

Residential Air Conditioning

The residential air conditioning conference, held Tuesday forenoon, heard a pre-conference address at the welcome luncheon Monday by Clarence H. Lindner, Vice-President Engineering, General Electric Company.

Mr. Lindner made the prediction that by 1960 more than 200,000 heat pumps would be sold annually at an installed price of something less than two million dollars. Sales on room units, he said, should reach approximately two million a year by that time and the larger packaged units for commercial installations should reach 1,500,000 annually in 10 years, compared with 350,000 sold in 1952. The sixty thousand installations of year round residential systems predicted for the coming year he described as a minimum figure.

The future is going to surpass anything that's happened in the past, he continued. In the entire electrical industry, sales, including generating equipment, light, bulbs, major appliances, etc., in the next 10 years will equal total sales of the past 75 years, and the refrigeration industry can equal or exceed that figure, he declared.

Engineers attending this conference had an opportunity to get the viewpoint of the contractor-builder of homes, on air conditioning in general and on the packaged conditioner in particular, from the first speaker, Emanuel Spiegel of the National Association of Home Builders, Washington, D. C.

Mr. Spiegel put the question "From the builder's viewpoint, what is wrong with existing air-conditioning systems offered for homes?" One of his answers to this question is that the equipment is physically too large. It occupies more space than can be spared, and insufficient planning has not been done to put the equipment in spaces that are otherwise unusable such as attics. He noted improvement, particularly in height dimensions. Included in this criticism of size, were the water savers and similar accessory equipment, and the speaker mentioned the need to better blend them with the architecture and landscaping.

As would perhaps have been expected, he stated that the original cost of the equipment was too great. He gave 19 percent as the present portion of the cost of a home, required for the electrical and heating equipment, and felt that with proper combination of design, it would be possible to include air-conditioning without increasing the 19 percent to more than 22 percent.

Design

R. M. Thompson, Bryant Heater Division, Affiliated Gas Equipment, Inc., Cleveland, Ohio, discussed design considerations in combining summer and winter residential air conditioning. One of his company's chief design considerations is to adapt air-conditioning equipment to heating equipment. Their designs have been centered on warm air furnaces, of which more have been sold than all other types of heating equipment combined.

Their second consideration was to refine the designs of air-conditioners, again keeping in mind that they were to be used in conjunction with and connected to warm air furnaces. To do this, they have two separate units, a winter warm-air heating unit and a summer cooling unit. Each of these are made in a variety of sizes so that numerous combinations of capacities and air volumes can be made to fit conditions of varying ratios of winter heating-summer cooling loads.

W. B. Cooper, American Radiator and Standard Sanitary Corp., Pittsburgh, Pa., discussed the installation of packaged air conditioning in modernizing existing homes.

In order to make a successful application of air-conditioning to an existing heating system, the speaker outlined five steps.

1. Surveying the heating system including the ductwork. The speaker stressed the importance of the survey.

2. Calculate the cooling load and select the equipment best suited to do the job.

3. Plan the installation carefully, taking all established data into consideration in making the lay-out.

4. Install the equipment mechanically right and in a workmanlike manner.

5. Service the equipment right, if and when service is required. The speaker declared that is highly important. "In service lies the quality of the job, and the success of our future in this business."

Frank Y. Carter, Detroit Controls Corporation, Detroit, Mich., presented some information on restricted air conditioner control systems.

In introducing his subject, the speaker said that the tendency in the past had been for each manufacturer to specify an individual type of control for his equipment. Some of these differed widely from most types, while others differed in only slight particulars.

This condition requires the control manufacturer to build controls on a ratio of about 20 individual and different controls for 25 customers. The result is that it is difficult to keep costs down; whereas, if all 25 could use one standard control system, minimum production costs could be realized, deliveries accelerated, and service interchangeability in the field simplified.

Water Conservation

The water conservation problem was discussed by R. E. Holmes, Worthington Corporation, Holyoke, Mass. The speaker stated that the expected demand and sale this year for combination heating and cooling systems for residences, has been estimated all the way from 35 to 75 thousand units. In either case, water systems in most localities will be unable to take on this additional load without serious and prohibitive strain on their capacities and water pressures.

Some superintendents or operating boards of water plants, take the attitude that regardless of how great the demand, the water facilities must be expanded to meet the demand. Most water producers take the opposite position; that water must be conserved. They point out not only the extreme expense of providing the facilities, particularly the distribution systems, but that in many areas the

supply of water is limited and that the water table in most areas is becoming alarmingly low.

A paper describing a water saving device prepared by Paul Wyckoff, Airtemp Division, Chrysler Corp., Dayton, Ohio, was presented by Joseph Lovely, chief engineer of Airtemp.

He showed colored slides of Airtemp units which are equipped with conventional water cooled condensers and can therefore be used without their water saver in those areas where the use of water is not restricted or where water is available from wells, water towers, spray ponds or other sources.

Most of the presentation was devoted to a description, aided by colored slides, of their featured water-saver. This consists of two automotive type radiators back to back with a fan and water pump between them, all of which is enclosed within a louvred cabinet.

The water saver is placed in the yard, on the roof or other suitable place, and connected with piping to the water-cooled condenser on the air conditioner. This secondary system is then filled with water (with anti-freeze in cold climates) and the water circulated by the pump in the water saver.

Experience with the heat pump after one year's operation was the subject of a paper by D. W. Lynch, General Electric Company, Bloomfield, N. J.

The speaker first answered the unspoken question of why they had chosen air as the heat source. It was felt that this opened a wider field of sales and permitted them to produce a completely packaged system. However, they added supplementary electrical resistance heat to the units so as to permit the use of the units much farther north than would otherwise have been possible. With this supplementary heat, their unit gets into the great populous areas of a large part of the eastern seaboard and some of the midwest.

Domestic Engineering Conference

At the Domestic engineering conference at the Monday forenoon session, subjects relating to design and performance of home freezers were discussed by ten speakers. At this session, advantages of the upright as compared with the chest type freezer were discussed by a number of speakers. Engineering considerations, including vapor barriers, exterior sweating, design and insulation were discussed.

Technical Sessions

In addition to the special conferences, three technical sessions were held on Monday, Tuesday, and Wednesday forenoons, at which various phases of air conditioning, cooling towers, compressor design and operation were presented in technical papers.

First Technical Session

A. M. Morris, Baltimore Aircoil Company, Inc., Baltimore, Md., discussed an air cooling selection chart.

The author stated that although methods exist for calculating the capacity of a cooling tower, they are primarily intended for use in designing a tower for a specific application and set of conditions; moreover, that these methods require rather involved mathematical computation.

Feeling that there is a need for a simple method by which the test engineer can test a cooling tower operating under known conditions, the author devised a set of curves that require only simple calculations to obtain the capacity of the tower under the test conditions.

To use these tables, the following data must be known, but they can be obtained by the test engineer with instruments normally available in the field:

1. Entering water temperature.
2. Leaving water temperature.
3. Wet bulb temperature of entering air.
4. Rate of flow of the water.
5. Rate of flow of the air.

With the first three known, the curves establish a "Capacity Multiplying Factor" which multiplied by the "Nominal TR" gives the actual total capacity of the tower in tons, based on a heat rejection of 15,000 Btu per hour per ton.

The Nominal TR is found by the formula:

$$\frac{\text{Range} \times \text{GPM} \times 8.33 \times 60}{15{,}000}$$

where the Range is the difference in temperature (°F) between the entering and leaving water.

Air cooling coil performance was discussed by D. D. Wile, Refrigerating Engineering, Inc., Los Angeles, Calif.

In this paper, the author presented a graphical method of selecting multiple finned coils for cooling and dehumidifying air. The advantage of this method is greater accuracy than those commonly used in the field, but more simple than the factory laboratory methods. The method is applied to coils using chilled water as the refrigerant, but it is also applicable to coils using primary refrigerants.

The method described, uses the usual dry coil formula:

Capacity =

No. rows × k × Face Area × MTD

where K is the coefficient of heat transfer per square foot of face area of a row, per degree per hour, and MTD is the logarithmic mean temperature difference between the air and the water. The constant K must, of course, be established from experimental data, and presumably made available by the coil manufacturer.

In this method however, the MTD is based on the "Equivalent Temperature" of the entering moist air, lying between the wet bulb and dew point temperatures, and determined graphically by the use of modified psychrometric chart shown in the paper.

The author stated that his method has been given limited use in the field, but not enough to fully determine whether or not it will be generally acceptable. Although doubtless much more exact than the empirical coil selection methods generally employed, the use of this graphical method will be limited to those having a working knowledge of the application of the psychrometric chart to air-moisture problems.

Radiant Conditioning

Year-round reflective radiant conditioning was discussed by C. A. Mills, University of Cincinnati.

This paper constituted a second report on a continuing test of reflective radiation type heating and cooling in a model home on a high bluff overlooking the city of Cincinnati. Since the first report of a couple of years ago, the equipment has been changed considerably, as it was found that the original equipment was of insufficient capacity; also changes were made as a result of data acquired in testing the original equipment. Even the house construction was modified somewhat.

Technical considerations affecting air force air conditioning requirements was discussed by W. T. Smith, U. S. Air Force, Washington, D. C.

In this paper, the author stressed the difference in the basic need for air conditioning in civilian life and in the Air Force. Air conditioning for human comfort plays a very small part in the application of air conditioning to air force buildings. Conditioning of the air for the protection of mechanical equipment is the main determining factor in the application of air conditioning to Air Force structures. Typical of such installations are those in radar stations, or storage areas for instruments or other precision equipment.

The Air Force has established 80° dry bulb and 67° wet bulb as an opti-

mum condition, with the stress on wet bulb control at the expense of the dry bulb. With the aim of air force conditioning beamed at protection against corrosion and other effects of excess moisture, this viewpoint is understandable.

The speaker also stressed the paramount importance of dependability of the equipment and the resulting value of preventative maintenance.

Second Technical Session

A discussion of compressor design —including some unique types was given by A. A. McCormack, McCormack Engineering, Cleveland, Ohio.

In his paper the author reviewed and briefly described the more common types of reciprocating and rotary compressors, but not centrifugal compressors. Nor did he attempt to cover all of those discarded types or other types which have never been sufficiently developed to be economically feasible such as gear type, spiral tube mercury types or wobble plate types.

The author commented on some suggested types of unique design which were found impractical or too expensive to build. These included an electric solenoid vibration type designed to give piston strokes in synchronism with the electric current; namely 7200 strokes per minute on 16 cycle current. Since there was no limit to the travel of the piston, it struck the valve plate each compression stroke and was of course very noisy and would doubtless have a short life.

He also mentioned a radio using a floating rod from each cylinder which allowed all cylinders to be in the same vertical plane. Mentioned also was a piston type compressor in which the piston was rotated through 360° and given reciprocating movement by maintaining the cylinder at an angle to the driving shaft. This used no spring loaded valves, both the discharge and suction ports being alternately covered and uncovered by the rotation of the piston.

He pointed out that the rotary compressor has distinct advantages in the small space required and that it does not require a suction valve; moreover, there is comparative freedom from vibration-producing reciprocating parts. Also, there is no quick reduction of pressure on the oil chamber at the start of compressor operation. On the other hand, the author pointed out the disadvantages of the rotary, such as requiring a high degree of accuracy in manufacture, tendency for the refrigerant to condense in the high side dome of the rotary and the high temperature of the motor windings.

Internal Roughness

The effects of internal roughness on the pressure drop and heat transfer characteristics of internal finned tubes were discussed by V. R. S. Arni and J. E. Myers, Purdue University, W. Lafayette, Ind.

This investigation was carried out with sections approximately 18 feet long of ½, ⅝ and ¾ inch nominal O D copper tubing having external spiral fins integral with the tube itself and with the internal surface of the tubes somewhat roughened in the process of forming the external fins. Bare copper tubes of ½ and ¾ inch nominal O D were also tested and the results compared with the above-mentioned finned internally roughened tubes. The finned tubes of ¾ inch and ½ inch nominal diameter had 19 fins per inch and the ⅝ inch tubes had 7 fins per inch.

The tubes were placed in a horizontal position and water was flowed through them from a reservoir, maintaining a constant 50 foot head. Rate of flow was measured by weighing the outlet water. Pressure drop was measured with a 6 foot manometer.

The tests showed that there was no appreciable difference in pressure drop between the plain, smooth inside wall, ¾ and ½ inch tubes and the tubes of like size having 19 external fins per inch and somewhat roughened inner surfaces. In the case of the ⅝ in. tubes having 7 fins per inch, there appeared to be an increase of about 10 percent in the friction factor due possibly to the longer "wave" form of the inner surface.

It was further brought out that the heat transfer characteristics follow the friction factors and pressure drop characteristics, so very little if any difference in heat transfer could be expected for the tubes tested.

Heat transfer film coefficients for refrigerants boiling inside tubes were discussed by Merle Baker, University of Kentucky, Lexington, Ky. The speaker described a preliminary investigation of the subject started at Purdue University but to be continued jointly by Purdue University and the University of Kentucky. Co-authors of the paper were Y. S. Touloukian and G. A. Hawkins.

The authors stated that although many similar investigations have been made whose purpose has been to obtain practical overall conductance factors, this investigation was concerned with obtaining experimental data on heat transfer coefficients from a horizontal tube to the boiling refrigerant within.

Design differences in refrigerating systems due to different thermodynamic properties of two refrigerants were discussed by Leon Buehler, Jr., Creamery Package Manufacturing Company, Chicago, Ill.

Before entering into the defined subject of his paper, the author reviewed some of the fundamentals of state of refrigerant vapor during saturation and when superheated, particularly bringing out the inherent difference between ammonia and Freon-12 in their ratios of specific heat of the vapor at constant pressure to constant volume. The lower ratio for Freon-12 makes possible different uses for suction vapor superheat for Freon-12 than for ammonia. He also brought out the limiting factor on permissible superheat of the ratio of compression, since both the ratio of c/p over c/v and the ratio of compression are the deciding factors in the amount of superheating during adiabatic compression.

Ideally for the compressor efficiency and capacity, the suction vapor should be in a saturated condition, but practical consideration prevents the use of "wet" compression, these considerations being concerned chiefly with lubrication and "slugging."

Since a minimum superheat of the suction gas is more important to ammonia than Freon-12, the author suggested an optimum superheat of 10F for ammonia, but permits temperatures as high as ambient for the Freon-12 suction gas. He particularly warned against the hazards of slop-over of liquid refrigerant even in ammonia compressors; slop-over being even more objectionable in Freon-12 compressors.

Permissible superheat of the suction gas may be utilized in a heat exchange between the liquid to the evaporator and the suction gas, to the compressor particularly in the case of Freon-12. The author pointed out that while this practice is usually helpful with Freon-12, it is not ordinarily employed with ammonia with which the permissible amount of suction superheat is small.

The author pointed out that even in the case of Freon-12, the use of the refrigerant line heat exchanger may do more harm than good if it is so constructed that there is high pressure drop.

Where ammonia suction lines are very long, the heat losses may be so great as to warrant superheating the suction vapor near the evaporator outlet, and inject liquid ammonia near the compressor in order to improve compressor efficiency.

The author also mentioned the value in de-superheating the hot discharge gas from the compressor and suggested its use in heating water, or warm service rooms.

Third Technical Session

Air conditioning test facilities was discussed by S. S. Bartlowe, Bohn Aluminum and Brass Corp., Adrian, Mich.

This presentation consisted of a sound film in color of a test room designed and constructed by Bohn Aluminum for testing various types of refrigeration equipment. The narration described the features of construction of the room and the instrumentation. Obviously, a great deal of planning, time and money went into this very up-to-date and completely equipped test facility.

R. L. Miller, Anemostat Corp., Hartford, Md., discussed sound and vibration control.

In this paper, the author covered the general subject of absorbing or isolating vibration in refrigeration and air conditioning equipment. He particularly brought out that vibration and noise are not always synonymous. Vibration may occur at levels that are below or above the audible range, and still be highly objectionable in its effect on the equipment itself and on adjacent structures.

Capillary Tubes

Selection of capillary tubes for domestic refrigerators, home and freezers, and air conditioning units was discussed by J. R. Prosek, International Harvester Co., Evansville, Ind.

In this paper, the author proposed a method of selecting a capillary tube for a refrigerator, freezer or air conditioner on a basis of overall economical performance within the normal operational range. He described the method as sufficiently accurate for trial selection, with perhaps some change in length as a result of a subsequent performance test.

It is inherent in the performance of a capillary tube as a restrictor, that it has an optimum operation point and that its performance falls off as changes occur in the optimum conditions of temperature, pressure and flow rate. In practice, however, the capillary tube is less critical than was originally supposed, and experience has shown that it gives satisfactory performance over a limited range of operating conditions.

In a paper on metastable flow of Freon-12 — flow in comparatively stable condition, P. F. Pasqua, University of Tennessee, Knoxville, Tenn. described metastability as the state of a liquid when it is still a liquid, but above its saturation pressures and temperatures, as differentiated from its stable equilibrium state. Metastability can occur either when a gas-free liquid is lowly heated above its saturation condition or when a saturated liquid passes through a nozzle. The liquid care in a nozzle exists in a metastable state, surrounded by a vapor state between the liquid care and the nozzle. In such a condition, the liquid is at a temperature far above its saturation temperature corresponding to the pressure inside the nozzle.

Corrosion Resistance

Corrosion resistant finishes for air conditioning equipment was presented by P. O. Blackmore, Interchemical Corp., Newark, N. J.

This presentation was based on the electro-chemical theory of corrosion of metals, and the first part of the paper was an explanation of electrochemical corrosion.

When two metal surfaces come into contact with one another in the presence of moisture or other liquid that may serve as an electrolyte, an electric potential is set up in each metal, with the direction and rate of flow depending upon which of the two metals have inherently higher potential. Electro-chemical action is accelerated if the metals are dissimilar, but may occur with like metals depending upon their purity and on the electrolyte. The author showed a table of potentials of various metals.

At the final session, the proposed American Standards on Home Freezers was accepted. Standard No. 16 Rating Air Conditioners also was accepted.

Presentation of ASRE Section Charters were made to H. A. Simpson for the Memphis Section and to H. W. Broadwell for the Houston Section. The Society now has 33 active Sections, including Dayton and Louisville whose charters are to be presented soon.

The next meeting of the Society will be held at the Shoreham Hotel, Washington, D. C.

Chicago Section A.S.R.E

THE Chicago Section, ASRE, held its annual golf tournament at Itasca Country Club on Thursday, June 18th. Low gross honors went to Ed. N. Johnson of Swift & Company with an 82. Geo. Sandy of Henry Vogt Machine Co. came in first in the blind bogie. Bud Kennedy of the A. J. Kennedy Company had the low net score, and Tom A. Watts of United Cork Companies won the crooked golf club trophy for the highest score. The Treasurer-elect, Edwin C. Ward, also of United Cork Co., was the Golf Chairman.

Refrigeration and Air Conditioning in India

AT A LARGELY attended annual dinner and social of the Refrigeration and Air Conditioning Trades Association Bombay, Jagdish C. Kapur, president of the Association, stated that the Association which was the mouth-piece of the trade had a special duty to perform in the growth of that industry in India. Refrigeration and air conditioning were essential parts of a national life and affected it more than any other industry. Hardly was there a phase of the national development, whether be it on the food front, textile production, pharmaceutical manufacture or defense industries, which it did not serve.

During the past five years, India faced many a problem which also in a small way reflected on the refrigeration and air conditioning trade. Today, they were looking forward with confidence to achieve set goals, which would materially improve the standard of living of the Indian people. In that task, the trade had pledged to make fullest contribution. It would endeavor to convert itself into a major industry and thus contribute to the general prosperity of the country.

Briefly tracing the history of the Association, Ahmed A. Fazal Bhoy, first president recalled early difficulties he had encountered some years ago in its formation in 1949. The problems created by the anti-hoarding and various controls and import restrictions contributed, he said, to bring together members of the trade and industry who finally joined the Association to voice their grievances and have their common difficulties solved through the medium of such a recognized body.

Speaking about the opportunities for work in that field, he stated that young men with broad vision, enterprise and hardwork established business with very small beginnings and had made remarkable progress.

He then referred to the Munir Fazal Bhoy School of Refrigeration and Air Conditioning Engineering founded, in memory of his son who died in New York by the Munir Fazal Bhoy Memorial Trust. The School trained students for Technicians certificates, which qualified them for a career as master mechanics or apprentice engineers. Some of the past students had gone out for further studies to Europe and USA and others had found employment with refrigeration and air conditioning firms in India.

Finally, he felt that with the joint effort and work of such enterprising men, the industry would flourish and benefit all and would make steady progress in the field which had great potentialities.

Shipments of Air Conditioning and Commercial Refrigerating Equipment – 1952

SHIPMENTS of components and accessories for air-conditioning and refrigeration equipment in 1952 were valued at $213 million, representing no change from the previous year, according to the Bureau of the Census, Department of Commerce. Shipments of condensing units in 1952 totaled 698 thousand, valued at $65 million, compared with 840 thousand units valued at $76 million in 1951. A total of 1,677,300 compressors and compressor units, valued at $71 million, were shipped in 1952. This represents increases of 59 percent in number and 25 percent in value compared with 1951. The value of heat-exchanger equipment shipped in 1952 amounted to $63 million, down slightly from the previous year, and shipments of centrifugal refrigeration systems, at $14.0 million, showed a decrease of $1.3 million from 1951.

Unitary Equipment

Shipments of self-contained air-conditioning units totaled 424,105 valued at $133 million in 1952, up 50 percent and 42 percent, respectively, over number of units and value in 1951.

Tables Show Data

Table 1 presents a historical summary of the quantity and value of shipments of air-conditioning and refrigeration equipment by class of product for the period 1948 through 1952. Other tables show the quantity and value of shipments of condensing units for 1951 and 1952, and 1951 and 1952 data on quantity and value of shipments of compressors and compressor units, and number of compressor bodies manufactured, a compressor body being defined as the basic compressor casting; data on heat-exchanger equipment, and figures for self-contained air-conditioning units and other types of air-conditioning and refrigeration equipment.

Scope of Survey

The figures on quantity and value of shipments in this report represent completed sales of equipment, i.e., units actually billed and shipped. Complete units delivered on consignment or shipped to a branch warehouse for stock are not included until such time as they are actually sold. The dollar values shown are the manufacturers' net billing prices.

This release presents data for all known companies manufacturing components and accessories for air-conditioning and commercial refrigeration and complete air-conditioning equipment of the types specified. The 1952 figures are based on reports received from 128 companies on Census Form MA52A.

This publication was prepared in the Industry Division under the supervision of Clarence H. Olsen, Chief of the Metals and Metal Products Section by William R. Gray and Charles W. Settlemyer.

Corn Icing Tests

THE Agricultural Experiment Station of New Jersey studied sweet corn icing last season. A report on the project has just been released. The test included a comparison of costs of various types of containers, temperature changes from farm to market, costs of handling and icing corn in wet-strength paper bags, and trade and consumer acceptance of iced corn.—Ice News.

TABLE 1—AIR-CONDITIONING EQUIPMENT AND COMPONENTS AND ACCESSORIES FOR AIR-CONDITIONING AND REFRIGERATION EQUIPMENT: QUANTITY AND VALUE OF SHIPMENTS, BY CLASS OF PRODUCT, 1948-1952

(Value figures in thousands of dollars)

Class of Product	1952		1951*		1950		1949		1948	
	Number	Value	Number	Vlaue	Number	Value	Number	Value	Number	Value
Condensing units, total	698,473	$64,834	840,176	$75,672	885,913	$75,833	610,341	$53,534	841,609	$73,443
Ammonia refrigerants	209	300	240	404	245	352	254	346	1,129	1,799
Refrigerants (except ammonia), total	698,264	64,534	839,936	75,258	885,668	75,481	610,087	53,188	840,480	71,644
Air-cooled	659,441	50,541	796,303	58,624	835,239	59,035	570,280	40,127	797,098	56,829
Water-cooled	38,823	13,993	43,633	16,644	50,429	16,446	39,807	13,061	43,382	14,815
Compressors and compressor units, total	1,677,300	71,047	1,051,937	56,669	954,368	46,977	604,431	29,929	459,390	33,493
Ammonia refrigerants	1,825	4,708	2,401	6,465	2,652	6,756	2,240	5,620	4,156	9,209
Refrigerants (except ammonia)	1,675,475	66,339	1,049,536	50,204	951,716	40,221	602,191	24,309	455,234	24,284
Heat-exchanger equipment, total	.....	63,456	.....	*64,935	.....	61,337	.....	40,925	.....	48,552
Evaporative condensers	4,912	7,326	6,216	8,652	7,818	8,869	4,798	5,850	5,560	7,505
Air-conditioning units (not self-contained)[1]	43,492	14,534	33,263	14,636	29,704	11,671	30,044	7,997	21,633	8,276
Unit coolers, refrigeration	76,703	11,492	88,718	12,660	103,596	12,917	65,806	7,710	81,192	9,598
Other heat-exchanger equipment[1]	.....	30,104	.....	*28,987	.....	27,880	.....	19,368	.....	23,173
Self-contained air-conditioning units, total[2]	424,105	133,101	282,488	93,573	257,263	86,913	123,709	50,584	111,620	49,008
Window-sill type	357,106	67,271	228,964	42,442	187,224	31,373	78,454	14,425	(d)	(d)
Other than window-sill type[2]	66,999	65,830	53,524	51,131	70,039	55,540	45,255	36,159	(d)	(d)
Other air-conditioning and refrigeration equipment, total	.....	40,668	.....	36,537	.....	n. a.	.....	n. a.	.....	n.a.
Centrifugal refrigeration systems	363	14,040	441	15,300	382	12,249	285	8,189	361	10,351
Ice-making machines	26,693	12,833	12,998	8,804	14,914	8,907	6,902	4,641	5,947	5,266
Year-round air-conditioning units (self-contained, except heat pumps)	10,473	6,876	7,728	5,863	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
Mechanical dehumidifiers, refrigeration type	72,017	5,201	75,659	4,731	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
Absorption and adsorption systems and equipment	119	1,713	138	1,839	(d)	(d)	(d)	(d)	(d)	(d)

*Revised.
n. a. Not available.
dWithheld to avoid disclosing figures of individual companies.
[1] Represents unit coolers, air-conditioning, for 1951 and earlier years. Also, data for surface dehumidifiers which for 1951 and earlier years were included with "Unit coolers, air-conditioning" are included in "Other heat-exchanger equipment" for 1952. Separate data for surface dehumidifiers are not available prior to 1952.
[2] For 1951 and earlier years, includes data for self-contained air-conditioning units designed especially for use in year-round air-conditioning systems. For 1952, data for these units are included under "Year-round air-conditioners (self-contained, except heat pumps)."

Dry Ice Refrigeration For Truck Trailer

TESTS have been conducted by the Production and Marketing Administration of The Department of Agriculture to detrmine the ability of one type of dry ice system of refrigeration to hold frozen foods at or near loading temperatures during the transit period, and to obtain other pertinent information concerning the refrigerating unit, such as ice consumption, reliability, and maintenance problems.

One preliminary performance test and four transit tests were conducted during a 3-month period from August to October 1952. However, owing to adverse conditions encountered during the loading and transit period of one test, it was possible to draw conclusions concerning ice consumption and refrigerating efficiency from only three of the four transit tests.

Preliminary Test

The preliminary performance test was conducted over a 24-hour period in August 1952. It was found that 18 hours were required to reduce the temperatures inside the trailer from 57 to 0 F. The ice consumption rate for the 24-hour period was approximately 33 pounds per hour. From a total supply of 960 pounds of dry ice, 790 pounds were consumed.

The three transit tests showed average temperature rises between the times of loading and unloading of 6.0, 3.4, and 7.2 F. For the three tests combined the average loading and unloading temperatures were —4.0 and 1.6F, respectively. Outside temperatures ranged from 52 to 98 F during the two transcontinental tests, and for the Florida to Texas and Florida to New Jersey tests, the range was 70 to 95 F.

The quantities of dry ice consumed while the test trailers were in transit ranged from 20 to 26 pounds per hour. Except in one instance, dry ice was available when needed throughout the test periods at a cost of 3.1 cents per pound. No mechanical difficulties in the refrigeration system were encountered during the tests.

A dry ice bunker was installed in a 32-foot-6-inch tandem semi-trailer with 6 inches of fiberglass insulation in the walls, flooring, and ceiling. Outside sheathing of the test trailer was aluminum and inside sheathing was plywood. The side walls of the interior of the trailer were stripped vertically with wooden slats, 2 inches wide and ⅞ inch thick, spaced 6 inches apart. Floor racks of 1 by 3 inch lumber allowed a space of slightly more than 2 inches for the circulation of air underneath the load and five 2 by 1⅝ inch wooden strips, spaced 6 inches apart, were nailed vertically to each of the rear doors.

A small door was installed in the curved surface of the right side wall adjacent to the nose of the trailer to permit access to the bunker for icing. The heavy canvas curtains at the rear doors of the trailer, were provided to minimize the loss of refrigeration during loading and unloading operations.

The basic unit of the dry ice system of refrigeration was a welded aluminum ice bunker with a capacity of approximately 900 pounds of dry ice. The unit consisted of finned exterior surfaces, supported by a welded steel frame and enclosed by an outer steel housing. The dry ice was placed on three ¼-inch aluminum shelves which were welded to the exterior fins to provide maximum conduction of heat. These shelf compartments were sealed by a gasketed access door so that the dry ice would not come in contact with the air in the cargo space. Carbon dioxide, resulting from the sublimation of dry ice, could be released into the cargo space or to the outside by means of appropriate valves.

Air Circulation

The circulation of air in the trailer was provided by two blower fans located above the bunker. One fan operated continuously, drawing the air through a bypass in the unit. The other fan, pulling the air from under the floor racks, passing it over the finned surface of the bunker where it was cooled, and then distributing it over the load, cycled on and off automatically from the setting of the thermostat.

The only moving parts in the system were the two blower fans electrically operated from the tractor battery. For lay-overs, an accessory transformer was available for connection to any 110-volt a.c. power source.

It should be pointed out that the heavy canvas curtains provided at the rear doors of the test trailer should not be closed during transportation, since closing the curtains would curtail the circulation of air around the load and nullify any benefit derived from the vertical strips nailed to the rear doors.

Mention should also be made of the fact that temperatures of the commodity located in the top and end positions in the load will show a sharp rise if unloading is not started immediately after the trailer doors are opened at destination.

Throughout the test periods no mechanical defects pertaining to the refrigerating system were encountered and, except in one instance, a sufficient supply of dry ice was available to maintain the refrigerating system satisfactorily.

Later Report

A later report on this study of using dry ice as a secondary refrigerant has been issued by the Production and Marketing Administration of the United States Department of Agriculture. The report was prepared by Harold D. Johnson and C. Elliott Garver, Marketing and Facilities Research Branch, and J. R. Winston and Randall Cubbedge, Bureau of Plant Industry, Soils and Agricultural Engineering. Results of the test are summarized as follows:

The dry ice system of refrigeration employed in the test reported was an adaptation for motor truck use, of a system installed and tested in a railroad refrigerator car in January 1952. A preliminary performance test with the empty trailer was conducted on September 8-9, 1952, covering a period of 22 hours. Temperatures inside of the trailer were reduced from approximately 56 to O F. in 12 hours and 45 minutes with the thermostat set at -12 F. At the conclusion of the test 9 hours and 15 minutes later, a further reduction to -10 F. had taken place. The system consumed an estimated 710 pounds of dry ice, during the 22-hour period, at an hourly rate of consumption of 32.3 pounds.

The transit test from Auburndale, Fla., to Philadelphia, Pa., covered 72 hours. The system was re-iced three times during the trip and total consumption of dry ice was 1,788 pounds, at a cost of $55.42. The hourly rate of consumption and cost were 24.8 pounds and $0.77, respectively. The average temperature of the load at the beginning of the test was -4.2 F. in comparison with an average of -1.9 F. at the end of the test—a rise of 2.3 F. The average temperature of the bottom of the load was consistently lower than the average temperature of the top of the load, indicating that the clearance between the cargo and the trailer was sufficient to allow the cold air to flow downward around and under the cargo. Additional tests of this type of refrigerating unit are expected to be made of its performance under other conditions.

Wide Acceptance of B9.1 Safety Code for Mechanical Refrigeration

REFRIGERATION equipment manufactured to conform with the safety provisions of the American Standard Safety Code for Mechanical Refrigeration, B9.1, can now be installed in 850 governmental jurisdictions without special alterations to conform with local ordinances. The B9 safety code has been adopted either outright by these cities, counties, and states or as incorporated in the model codes of other organizations. In announcing this, Vice Admiral G. F. Hussey, Jr., managing director of the American Standards Association, stated that universal adoption of the code would not only help to eliminate unnecessary costs of specially built equipment but would assure the adequate safeguarding of persons and property in commercial and residential occupancies, particularly in apartment houses.

Growth of Code

Myron D. Miller, executive secretary of the Refrigeration Industry Safety Advisory Committee, stated that this growth in the use of the code could be credited largely to the trend of establishing model codes, many of which incorporate the safety recommendations of B9. The Basic Building Code of the Building Officials Conference of America, for example, was established in 1950. It has been adopted by a number of cities, thereby establishing the B9 Safety Code, a part of the BOCA code, as the required provisions for those cities. The National Board of Fire Underwriters has two codes — the National Building Code, governing air conditioning and the Fire Prevention Code, governing all refrigeration installations, both utilizing the B9 code which have been adopted by many cities.

Three hundred cities, the committee states, have adopted the optional refrigeration provisions of the Uniform Building Code of the Pacific Coast Building Officials Conference, which are based on the B9 standard. Because the code is so widely accepted throughout the country, most manufacturers are meeting the minimum standards of the code in the manufacture of their equipment. Consequently, cities that have provisions for mechanical refrigeration which differ from the code may require the alteration of equipment before it is installed.

Object of Code

Object of the code is the protection of occupants of residential, commercial, industrial, and public buildings from accidents or fire resulting from the operation of refrigerators or refrigerating machinery. It was first developed in 1930, went through several subsequent revisions, the latest in 1950, and is currently in the process of being brought up to date.

Original impetus for the establishment of safety rules for mechanical refrigeration came following the increased use of chemicals as refrigerants. Safety authorities demanded that safety rules be adopted to govern all mechanical refrigeration systems. Manufacturers were concerned lest a variety of safety rules throughout the country place unnecessary restrictions on their operations. They sought the development of uniform safety rules that could be adopted by all states and thus eliminate the possibility of undue increase in the cost of refrigeration systems to the users.

Through the procedures of the American Standards Association, representatives of national groups concerned with the production of mechanical refrigeration equipment and the manufacture of refrigerants, of government, safety and insurance groups, and representatives of users were brought together to set up the code.

The code's requirements apply only to the occupancy classifications listed, and the requirements differ from the various types of refrigerants as the need varies for the different occupancies.

Refrigerator Sales In Canada

PRODUCTION and factory shipments of domestic electric refrigerators again increased sharply in April, according to Dominion Bureau of Statistics. Factory stocks were higher at the end of April than a year earlier.

Output of refrigerators in April rose to 23,657 units from 13,719 a year ago, and in the January-April period to 92,849 units from 43,009. Shipments climbed to 29,068 units from 23,203 in April, and to 98,179 from 69,891 in the four months. Month-end stocks rose to 29,468 from 19,802, a year ago.

Refrigeration and Air Conditioning Exposition

INCREASED sales opportunities through use of new models of refrigeration and air conditioning equipment will be one of the major themes of exhibits at the eighth All-Industry Refrigeration and Air Conditioning Exposition, it was stated by W. A. Siegfried, president, Superior Valve & Fittings Co., Pittsburgh, who is general chairman of the show. The show, held every two years, will take place November 9-12 at the Public Auditorium, Cleveland. Over 200 companies will be exhibitors.

The exposition will be the largest ever held in the field and will constitute the world's largest display of refrigeration and air conditioning equipment. It is sponsored by the Refrigeration Equipment Manufacturers Association. More than 2,500 experts will be on hand to answer questions of visitors. With 15,000 business executives expected, this will provide one expert for each six visitors and permit extensive discussions of engineering details of the equipment shown.

The emphasis will be on marketing opportunities for retail establishments and institutions, according to Mr. Siegfried.

"We are in a period when close attention must be given to new methods of attracting consumer spending," he said. "Refrigeration and air conditioning, fields whose potentials are just beginning to be realized, offer the best opportunities for aggressive marketing and open new areas for business for retailers and establishments such as restaurants, hotels and service stores.

"The era of mass production of air conditioning equipment has arrived and with it has come prices which any merchant can afford and specifications which fully meet his needs. The consumer has found that shopping can be a summer delight in an air conditioned store instead of an exhausting chore in an overheated place. No one can afford to overlook the possible competition of a clean, cool store down the street," he said.

"Refrigeration, too, is coming to be recognized not only as an essential marketing aid in food stores, but in many other types of businesses. Modern refrigeration equipment does more than keep things cold; it is an important marketing tool. In the instance of food freezers alone, the advances made have been so great as to render obsolete a refrigerator that is more than a few years old," he said.

International Institute Plans Active Program

THE member countries of the International Institute of Refrigeration are planning a program of cooperation in the field of construction of refrigerating machinery, in the field of cold storage, and also in the field of research applied to refrigeration.

The study of various problems relating to the applications of refrigeration was carried on during important meetings held in Mons (Belgium) and Wageningen (The Netherlands) by three Commissions of the Institute, namely: Commission 3 (Design, construction and operation of machinery for refrigerating and air conditioning plants) presided over by Professor Glansdorff (Belgium); Commission 4 (Applications of refrigeration to foodstuffs and agricultural produce) presided over by Dr. Fidler (Great Britain); Commission 5 (Cold stores and ice-making plants) presided over by Ing. Fontanel (France).

Technical Papers

Qualified experts presented scientific and technical papers bringing forth new ideas notably to (1) the construction of compressors, (2) relative humidity and dehydration of foodstuffs in cold stores, (3) present methods for the making and delivery of ice, (4) the cold storage of fruit and more particularly gas storage.

Commission 3 decided to draw up an international Test Code with a view to making uniform and comparable the testing of capacity and efficiency of the refrigerating machines manufactured in the different countries. A sub-commission directed by Professor Plank (Germany) has been entrusted with this work. In the same manner, an international safety code for refrigerating machines will be prepared by a subcommission directed by Mr. Randal Steward (Great Britain).

Commission 5 will endeavour to unify the bases of calculation of cold storage tariffs as well as the storage regulations in order to facilitate the international trade of foodstuffs.

Commission 4 decided to co-ordinate scientific research relating to the applications of refrigeration to perishable foodstuffs. Without limiting the autonomy of the various national laboratories and research stations and by assuring permanent contacts, this Commission will point out to such laboratories the research being made and the research desirable to be made.

Fruit Fleet Delivered

THE first 14 of a fleet of 125 mechanical refrigerated railroad cars under construction at the Pacific Fruit Express shops in Roseville have been delivered, it was announced by W. E. Becker, Pacific Fruit Express superintendent at Los Angeles.

CONVENTION CALENDAR

CANADIAN ASSOCIATION OF ICE INDUSTRIES
November 2-5, 1953
Seigniory Club, Montabello, Quebec
MILDRED E. CROFT, Secy-Treas.

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS
November 11-13, 1953
Purdue University, Lafayette, Ind.
J. RICHARD KELAHAN, Secretary

NATIONAL ASSOCIATION OF ICE INDUSTRIES
November 17-20, 1953
Hotel Statler, Washington, D. C.
GUY W. JACOBS, EXEC. Secretary

ASSOCIATION DIRECTORY

AMERICAN INSTITUTE OF REFRIGERATION
H. T. McDermott, Gen. Secretary, 433 N. Waller, Chicago 44, Ill.

NATIONAL ASSOCIATION OF ICE INDUSTRIES
Guy W. Jacobs, Secy., 1766 L St., N. W., Washington 6, D. C.

NATIONAL ASSOCIATION OF REFRIGERATED WAREHOUSES
Wm. Dalton, Exec. Vice-Pres. Tower Bldg., Washington 5, D. C.

NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATING ENGINEERS
J. Richard Kelahan, Secretary, 435 N. Waller Ave., Chicago 41, Ill.

CALIFORNIA ASSOCIATION OF ICE INDUSTRIES
Jack L. Dawson, Secretary
461 Market St., San Francisco, Calif.

CANADIAN ASSOCIATION OF ICE INDUSTRIES, INC.
Mrs. Mildred E. Croft, Executive Secretary
378 Eglinton Ave., E. Toronto 12, Canada

DELTA STATES ICE ASSOCIATION
R. N. Milling, Secretary
Ouachita Bank Bldg., Monroe, La.

EASTERN STATES ICE ASSOCIATION
R. H. Wilson, Secretary-treasurer
Delavan Ave. & Spruce St., Philadelphia, Pa.

FLORIDA ICE ASSOCIATION
Muriel Washburn, Secretary
1926 Silver St., Jacksonville, Fla.

GREAT LAKES CHAPTER, N.A.R.W.
Harry Foster, chairman
Cincinnati Terminal Warehouses, Inc.
Cincinnati, Ohio

GULF COAST ICE ASSOCIATION
J. L. Reed, president
Crystal Ice Co., Selma, Ala.

ILLINOIS ASSOCIATION OF ICE INDUSTRIES
W. D. Wright, Secretary
Clinton Pure Ice Co., Clinton, Ill.

INDIANA ASSOCIATION OF ICE INDUSTRIES
Robert W. Walton, Secretary
Board of Trade Bldg., Indianapolis, Ind.

KANSAS ASSOCIATION OF ICE INDUSTRIES
Matt Scherer, Secretary
McPherson Ice Company,
McPherson, Kansas

KENTUCKY ICE MANUFACTURERS ASSOCIATION
R. T. King, secretary
217 E. Main St., Louisville 2, Ky.

MICHIGAN ICE INDUSTRIES ASSOCIATION
Edward W. Jackson, Secretary
131 E. Kalamazoo Ave., Kalamazoo, Mich.

MISSOURI VALLEY CHAPTER, N.A.R.W.
H. A. Steinmeyer, chairman
Booth Cold Storage Co., St. Louis, Mo.

MISSOURI VALLEY ICE MANUFACTURERS' ASSN.
V. A. Esphorst, Secretary
3820 Washington St., St. Louis, Mo.

MOUNTAIN STATES ASS'N OF ICE INDUSTRIES
J. R. Espy, Secretary
Espy Ice Co., 2101-31st St., Denver 5, Colo.

NEBRASKA ASSOCIATION OF ICE INDUSTRIES
Frank Vogelsang, Secretary
W. T. Good Ice Co., Lincoln, Nebr.

NEW ENGLAND ICE ASSOCIATION
Raymond Wilber, Secretary
83 Winter St., Providence, R. I.

NEW JERSEY STATE ASSN., N.A.R.W.
Leo J. Fisher, president
Harborside Warehouse Co. Inc.
Jersey City, N. J.

NEW YORK STATE ASS'N REF. WAREHOUSES
Garth A. Shoemaker, president
Hygeia Refrigerating Co., Elmira, N. Y.

NORTH ATLANTIC CHAPTER, N.A.R.W.
Jerry Johnson, Chairman
Terminal Refrigerating & Warehousing Corp.
Washington, D. C.

NORTH CAROLINA ICE ASSOCIATION
Lewis H. Powell, Secretary
Capital Ice & Coal Co., Raleigh, N. C.

NORTH PACIFIC CHAPTER, N.A.R.W.
E. F. Swanberg, chairman
Diamond Ice & Storage Co.,
Seattle, Wash.

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1539 N. E. 37th Ave., Portland, Ore.

OHIO ASSOCIATION OF ICE INDUSTRIES
Elizabeth Shannon, Acting Secy.-Treas.
The Steubenville Ice Co., Steubenville, O.

OKLAHOMA ASSOCIATION OF ICE INDUSTRIES
Harry T. Hudson, Executive Secretary
525 Cravens Building 7, Oklahoma City, Okla.

PACIFIC STATES COLD STORAGE WAREHOUSEMEN'S ASSOCIATION
Jack L. Dawson, Secretary
461 Market St., San Francisco, Calif.

SOUTH CAROLINA ICE MANUFACTURERS ASS'N
Geo. L. English, Secretary
P. O. Box 603, Columbia, S. C.

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M. W. Young, Chairman
National Ice & Cold Storage Co.,
San Francisco, Calif.

SOUTHERN ICE EXCHANGE
Richard W. Florrid, Secretary
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SOUTHEASTERN CHAPTER, N.A.R.W.
W. B. Haggerty, Chairman
Tampa Cold Storage & Warehouse Corp.
Tampa, Fla.

SOUTHWESTERN CHAPTER, N.A.R.W.
C. P. Metcalf, chairman
Southwestern Ice & Cold Storage Co.,
Austin, Tex.

SOUTHWESTERN ICE MANUFACTURERS ASS'N
P. A. Weatherred, Secy. Counsel,
Mercantile Bank Bldg., Dallas, Tex.

VIRGINIA ICE MANUFACTURERS ASSOCIATION
H. H. Snyder, Secretary
Alexandria, Va.

WEST VIRGINIA ASSOCIATION OF ICE INDUSTRIES
E. Dana Smith, Secretary
Diamond Ice & Coal Co., Charleston, W. Va.

WISCONSIN ASSOCIATION OF ICE INDUSTRIES
Paul F. Hoff, Secretary
1300 East Locust St., Milwaukee, Wis.

New Plants and Improvements

Burbank, Calif. — The Lockheed Aircraft Corp. has started construction on a new $130,000 blizzard tunnel to be used by research engineers to improve methods of eliminating ice from airplanes.

Sacramento, Calif. — The National Ice & Cold Storage Company has started construction of an addition to the Sacramento plant. A single-story warehouse unit, it will increase the public cold storage space of the plant from 750,000 to 970,000 cubic feet. It is expected to have it in operation by September.

San Francisco, Calif.—The National Ice & Cold Storage Co. has launched an extensive building program which will involve the addition of a total 900,000 cubic feet of fully palletized freezer holding space at four locations: Sacramento, Watsonville, Oakland and Riverside.

Montreal, Canada — The Standard Fish Co. Ltd. plans to build a cold storage plant.

Watsonville, Calif. — A new cold storage warehouse of pre-cast concrete construction is being erected here for the Papero Valley Cold Storage Company. It will provide 27,000 square feet of floor space.

Logansport, Ind.—Repairs amounting to $5,000 are planned at the Artificial Ice Plant which was damaged by fire some weeks ago.

Albany, N. Y. — Construction has started on a 150,000 square-foot refrigerated food warehouse for Tri-City Produce Company on Railroad Avenue near Fuller Road, West Albany. Its cost is estimated at $150,000. The new one-story steel and masonry building will have conveyor unloaders to carry produce from refrigerated cars and trailers to coolers or freezers.

New York, N. Y.—An air conditioning plant has been installed in the Empire State Building at a cost of approximately $1,500,000.

Yakima, Wash.—The Ackley Fruit Company is putting up new cold storage and packing facilities costing $80,000 on the Naches Highway near Nelson Bridge. A concrete block storage plant 96 x 124 feet will provide refrigerated space for 100,000 boxes of fruit.

Madison, Wisconsin—Central Storage and Warehouse Co. has opened a new 70,000 cubic foot freezer addition as one phase of a long-range construction program. It will be fully palletized.

New Incorporations

Buffalo, N. Y.—Refrigeration Co. Inc. has been incorporated here with capital of 100 shares. Incorporators are Max E. Dozoretz, Sarah Dozoretz and Bernard Edelman.

Jackson, Miss.—The Morgan Ice Co. has been granted a Mississippi Charter.

Fire and Accident Record

Ozark, Ala.—The Ozark Ice & Cold Storage plant was destroyed by fire causing damage estimated at $45,000. The cause was believed to have been a faulty motor.

Mansfield, Conn.—The Brown Artificial Ice Manufacturing Co., plant was destroyed by fire with damage estimated by the owner at $125,000 partly covered by insurance. It started from an explosion in the engine room.

New Orleans, La.—A fire caused considerable damage to an abandoned ice house at 531 Chartres Street in the French quarter.

Glen Allen, Miss. — An ice plant here was destroyed in a blaze which the owner estimated caused damage amounting to $20,000.

Hempstead, N. Y.—A small fire at the Good Humor ice cream plant on Long Beach Road caused damage of about $300.

Charleston, S. C.—Fire of undetermined origin completely destroyed the one-story Charleston Freezer Plant.

Wheeling, W. Va.—A $10,000 fire destroyed the old Wheeling Ice and Storage plant. It was believed to have been started by "bayrunners" using the building for loafing and sleeping.

Sales and Reorganizations

Pueblo, Colo.—Lynn Belcher of the Mountain Ice & Coal Co. has purchased the ice making equipment of the Pueblo Ice Company.

New Orleans, La.—The Consumers Ice Co. has transferred to Morgan Ice Company a tract of land valued at $158,972.50.

Falmouth, Mass.—Sales of the Falmouth Locker Plant to Bert William Lewis, Michael Toomey and Stanley Brown has been announced by Lawrence C. Antonellis. This plant, in the Cape Cod area, represented the purchase of 4 associated businesses. In addition to the 1200-unit locker plant, opened in 1946, the concern operates a retail food store with wholesale meat department, the Eldridge & Bourne Ice Company, and a complete frozen foods distribution operation with storage warehouse. All activities will be continued by the new owners, all Boston businessmen.

Crozet, Va.—The Morton Packing Company, Louisville, Ky., has rented the Crozet Cold Storage Company plant with option to buy and will use it for processing frozen meats.

Waurika, Okla. — Directors of the Waurika Chamber of Commerce have voted to buy the ice plant in that city as a start toward attracting a small industry. The plan, located on a Rock Island spur is a brick building 60 x 80 feet on approximately 20,000 square feet of land.

Icy Items

St. Patrick, La.—The Vachiere Ice Company has filed notice of dissolution of its charter of incorporation.

DEATHS

ED H. DIEMMER, for many years Vice-President and General Manager of the Glynn Ice and Coal Co. Brunswick, Ga., died June 17. Mr. Diemmer suffered a heart attack early in 1952, following which he retired from active duty with the ice company, retaining his corporate position. He was a past president of the Georgia Ice Manufacturers Association and the Southern Ice Exchange.

PAUL J. RICH, founder and chairman of the Board of the Rich Ice Cream Company, Buffalo, N. Y., died of a heart attack recently. He was 73. Mr. Rich pioneered the use of mechanical refrigeration in making and distributing ice cream.

Frank C. Trotter, Rochester, N. Y., former member of C. W. Trotter & Sons, refrigerator manufacturing firm, died May 12. In later years he had operated his own air conditioning company here. A son and a daughter survive.

Fred David Lumary, Kansas City, Mo., who operated an ice company at Westport Road and Roanoke Parkway many years, died May 9. He was born in Huntingdale, Mo., and had lived in Kansas City thirty years.

O. J. YOUNG, plant superintendent of City Ice & Fuel Co. Pontiac, Mich. suffered a heart attack while at work and died at the Pontiac General Hospital. He was 67. Mr. Young had held his present position about 10 years.

ROY W. CARPENTER, 52, manager of the Consumers Ice & Fuel Co., Scranton, Pa., for the past five years, died June 13 after an illness of several weeks. His widow, a son and a daughter survive.

Air Conditioned Railway Coaches in India

VISITORS to Kashmir, India will be able to travel from June 1 onwards in air conditioned coaches from Delhi to Pathankot according to a press note issued by the Northern Railway. Since air conditioned coaches were already running daily on the Frontier Mail between Bombay and Amritsar and Howrah Delhi service, the facility of air conditioned travel will now be available from Bombay and Calcutta for visitors proceeding to Kashmir, Kulu and Simla, the press note added.

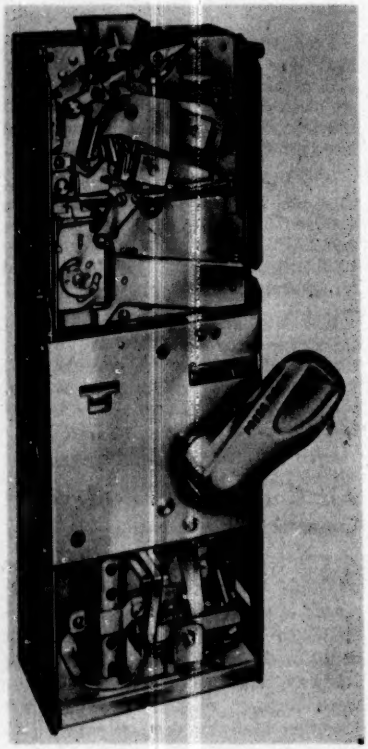
Air conditioned coaches will be introduced on Saurashtra mail between Bombay and Viramgam and vice versa. The daily air conditioned service started on May 25 from Bombay and from Viramgam on May 26.

What's New

MACHINERY
APPLIANCES • PROCESSES

National Announces New Mechanical Coin Changer

VENDING machine manufacturers are interested in the new mechanical coin changer recently previewed by National Rejectors Inc. of St. Louis. This new mechanical coin changer will take pennies, nickels, dimes and quarters and has all of the same features found in the popular National electrical changer. It has a remarkably simple construction making it easy to service and adjust. The changer may be converted from one price to another to give even or odd cent sales with no addititonal parts necessary.



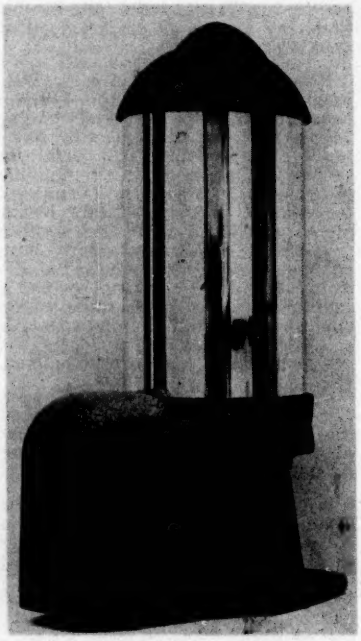
Cutaway view of new mechanical coin changer.

The new series 6500 has a $3.00 capacity in the tube, and the assembly is so designed that when the machine is sold out or the change chute has been reduced to five nickels an empty signal actuator and a coin return arm provide for the return of coins. Now, with this mechanical changer, vending machine operators can change the prices of their merchandise if and when it becomes necessary. Price changes require only a single quick mechanical adjustment and parts are easily accessible. In addition the new mechanical changer affords complete anti-jackpot protection plus as escrow for holding coins.

Sno-Master Ice Shaver

THE Sno-Master Manufacturing Co., of Baltimore, Md., manufacturers of Sno-Master Sanitary Ice Shavers, is now offering their machines to all retailers in the drug, grocery, refreshment counter and allied trades, and to all their distributors, for a free trial.

The machine, which is in use in leading chain stores, and in thousands of drug and grocery stores throughout the country, makes Sno-Balls and Cones. Profit on these items is 8 cents on every 10 cent sale, 12 cents on every 15 cent sale. The machine takes only one square foot of counter space. Case histories show that stores now using Sno-Master average $100 profit a week.

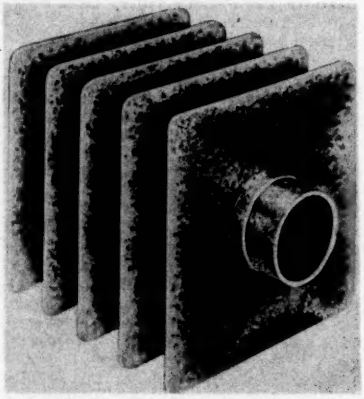


The New Sno-Master Ice Shaver

The Sno-Master is available for a free trial to all druggists, grocers and refreshment counter operators, and to distributors in these fields. Retailers are urged to contact their equipment jobber for a free trial of the Sno-Master. Equipment jobbers can obtain Sno-masters to accommodate Free Trial requests on memo. Retailers and jobbers can write direct to Sno-Master Mfg. Co., 124 Hopkins Place, Baltimore 1, Md., for further details.

Low-Temp Freezer Section

A NEW Bulletin on their Lo-temp freezer sections is announced by Industrial Manufacturing and Engineering Co., Chicago, Ill., manufacturer of heating, cooling, and drying equipment. The new bulletin emphasizes utility, application, construction and sizes of the product and is available by asking for Bulletin No. 33.



New Lo-Temp Freezer Section

The utility of this product as an evaporative surface for producing low temperatures in connection with refrigerating systems is varied. It finds its greatest use in industrial refrigeration applications such as freezing rooms, holding rooms, and working rooms in meat plants, fisheries, dairies, and wherever food must be protected or prepared by refrigeration. The Lo-temp freezer sections are constructed of 2⅜ in. O.D. x No. 1 gauge wall steel pressure tubes with No. 14 gauge, 7x7 in. square steel fins. The fins are stamped with large collar to furnish abundant contact between fin and tube. Assembly hot dip galvanized after fabrication.

They are made in three fin spacings and three tube lengths: series 60—2 in. 4.42 sq. ft.; series 80—1½ in. 5.68 sq. ft.; series 120—1 in. 8.21 sq. ft. They can be furnished with plain ends for welding or flanged ends for bolting.

YORK

When trouble threatens, call York's branch office, or the Industrial Sales Engineer who calls on you. They're equipped to give you genuine York parts, accessories, supplies and factory-approved service, *faster* and *better!*

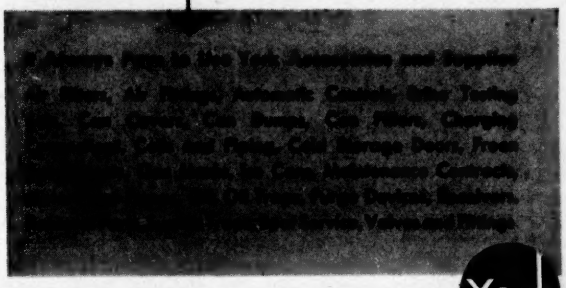
The cost is no more—so why take chances? York Corporation, York, Pennsylvania.

YORK VALVES & FITTINGS
Triple-Inspected, Double-Tested

York Valves don't leak. Each one is triple-inspected and double-tested at 300 lbs. per square inch pressure under water (for overall tightness). Sizes from ¼" to 14" IPS.

YORK SUPER-REFINED OIL
The finest oil you can buy

York refines its own oil. The result is the finest oil you can buy—*maximum* lubrication, evaporator efficiency—*minimum* power requirements, wear.



YORK REFRIGERATION AND AIR CONDITIONING

York

HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885

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FREE BRINE MAINTENANCE CHART . . . information on the preparation, strengthening and maintenance of Calcium Chloride Refrigeration Brine . . . and prices and location of nearest stock are available on request. MAIL COUPON TODAY!

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SOLVAY PROCESS DIVISION, Allied Chemical & Dye Corporation
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Please send me, without cost or obligation, your free Brine Maintenance Chart . . . information on the preparation, strengthening and maintenance of Calcium Chloride Refrigeration Brine . . . and prices and location of nearest stock.

Name.....

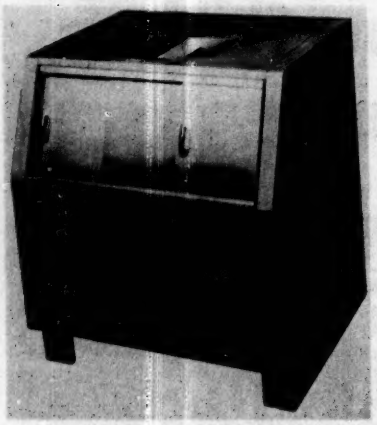
Company.....

Address.....

City..... *Zone*..... *State*..... 56-8

Ice Cube Storage Bin

THREE stainless steel sliding doors on an inclined front provide quick reach to the interior of the Model U-300 ice cube storage bin made by the Dunhill Soda Fountain Corporation.



Ice Cube Storage Bin

The capacity is about 250 pounds of cubes, kept in good condition for long periods by the use of better insulation in construction. Sides and top are approved fibre glass and the bottom is 2 inches of solid corkboard. Entire shell is treated with moisture-proof adhesive cement to create airtightness. Cabinet construction is all steel with 24 gauge stainless in the interior and 18 gauge baked Hammertone finish steel on the exterior.

Bin top is reinforced with ⅛ inch angular steel frame to support the ice maker. Bin drain is ½ inch I.P.S. brass outlet. Dimensions are 36 inches wide, 32 inches deep and 40 inches high.

Fastening Insulation With Steel Strapping

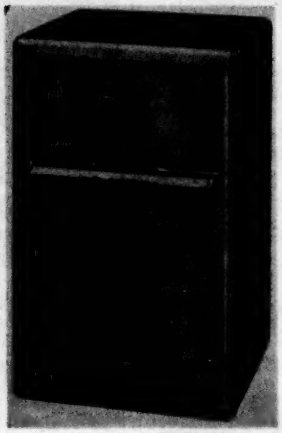
THE advantages of fastening insulation with steel strapping is explained in detail in Acme Steel Company's newest bulletin. This bulletin, entitled "Steel Strapping Fastens Insulation Firmly" describes how steel strapping tensions evenly around insulation, keeps seams tight, helps to prevent formation of destructive moisture and speeds up difficult jobs without cutting into or marring insulation. The type of strapping most suitable for each particular job is also explained. For the reader's convenience, size, weight and type of steel strapping are shown in table form.

Line drawings illustrate the many models of stretchers and sealers that are available. Text describes the physical features of each model and suggests the type most applicable for specific jobs. Schematic drawings show how Acme Steel's pusher bar tools tighten strap without slack, yet do not touch or damage insulation.

Photos show the variety of domestic and industrial applications of insulation—magnesia, glass, mineral wool, cork, etc. Captions, accompanying the pictures, tell some of the advantages customers have experienced in securing insulation with steel strapping.

Pebble Ice Maker

A NEW type of ice maker producing hard, clear ice Pebbles has been added to the Ajax line of ice making equipment. The "pebble" ice made by the new machine, although similar to crushed ice, is dry and non-mushy.



Ajax Pebble Ice Maker

This machine, called the Ajax Pebble Ice Maker, is available in three capacities, 200, 400, and 800 pounds per day. It is claimed to be one of the smallest, most compact made, taking less than one square yard of floor space. Its 39-inch height makes it well adaptable to under-counter installation. The machine has just three moving parts, thus insuring long-lasting, trouble-free operation.

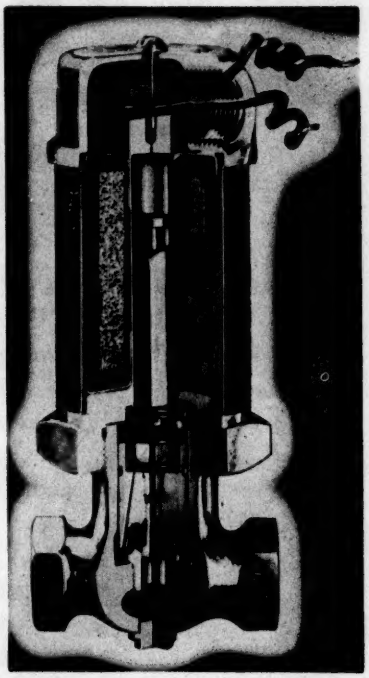
Performance features include an automatic cut-off switch which controls ice overflow no matter what type of storage container is used. According to the company, the new machine wastes less than three gallons of water per day.

Redi-Roll Floor Finish

A HEAVY duty plastic resurfacer for floors is being made by the Rock-Tred Corporation, Skokie, Ill. It comes in rolls ¼ inch thick and it is claimed will stand up under heaviest traffic. It is also claimed to be spark proof and tough enough to withstand more than normal wear. It is offered as an economical means of providing a smooth wearing surface for floors that have become worn and roughened by constant hard usage.

Atkomatic Valve Announces Improved Steam Valve

A STEAM valve offering new engineering principles which prevent "sticking"—a common cause of most steam valve failures, is announced by Atkomatic Valve Company, Indianapolis, Ind. Expansion caused by high temperatures combined with deposits



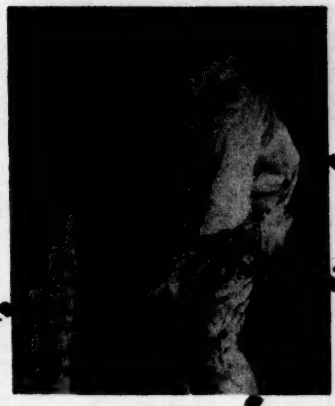
Cutaway view of new Atkomatic Valve

of iron oxide, boiler compound, lime, etc., formerly caused sticking and down-time for maintenance. Engineering principles incorporated in the design now automatically compensate for normal steam valve expansion and deposits, assuring greater valve efficiency, longer valve life, and lower maintenance costs.

Pallet Hardware

EQUIPMENT to aid tiering pallets has been introduced by the Paltier Corp., Michigan City, Ind. "Palteam" is a pair of tiering horses which may be assembled to any standard 3-stringer pallet. Designed for flexibility, the posts slip-fit into the socket assembly which is permanently secured to the pallet. "Cler-deck" is designed primarily to give user full use of pallet deck. Post and cone assembly is same as the "Paltier." It can be attached to most any pallet. Slip-fit posts and self aligning cones make for quick, sure safe stacking of loads. New type shelving hardware can be furnished for average loads and when completely assembled, provides a very stable rack.

BEST—from every angle—



BUILDING OWNERS:
get proved lower overall first cost plus efficient operation with low maintenance. Laykold products give permanent tight sealing that assures highest efficiency. No solvents are used; no odors to contaminate foods.

INSULATION CONTRACTORS:
get better work—easier, and faster, by trowel or spray, with these products that are applied *cold*—no danger of burns to workmen.

INSULATION MANUFACTURERS:
are assured of sealed protection of their material against moisture; positive self-sealing of nail holes and crevices; finished jobs that build customer-satisfaction.

Laykold® products for cold insulation construction

Laykold Insulation Adhesive • Laykold Cement • Laykold Weathercoat

The complete line of LAYKOLD PRODUCTS for cold insulation construction covers every phase of construction—floors, walls and ceilings.

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E. Providence 14, R. I. Perth Amboy, N. J. Baltimore 3, Md. Mobile, Ala.
Columbus 15, Ohio Tucson, Ariz. Seattle, Wash. Baton Rouge 2, La. St. Louis 17, Mo.
Inglewood, Calif. Oakland 1, Calif. Portland 7, Ore. Washington 6, D. C. San Juan 23, P. R.

BATEMAN CRUSHED ICE ELEVATOR

WILL DELIVER APPROXIMATELY 10 TONS OF ICE PER HOUR

The new Bateman Elevator conveys ice, that has been crushed, to discharge chute for bagging, etc. All parts that come in contact with the ice are galvanized.

- Standard height 7′ 6″.
- Floor to discharge chute 72″.
- Floor to top of hopper under crusher 24″.
- For heights taller than 7′ 6″ (above standard height) $25.00 per foot additional.

FEATURES:

- V-belt drive from motor to gear box.
- Gears are enclosed and run in grease.
- ½ HP. motor to drive elevator.
- Top and bottom sprocket shafts run on roller bearings.
- Connecting chains for cups are of steel and galvanized.
- Cups do not ride sides of elevator.
- Take-up slack on chain is outside of housing for easy adjustment.
- At bottom of housing, pull-out pan provides easy cleaning of any left over crushed ice.

The Bateman Elevator can be ordered without crusher, as the Bateman Elevator will work with any crusher.
Price of Elevator, less motor $450.00
Elevator with Monarch Crusher, less motor $685.00
Monarch Crusher takes a one HP. motor.
(Motors at prevailing prices.)

Regal MODEL 25 ICE CRUSHER

The New REGAL Model 25 has all steel frame legs, grate handle and grate. Self-aligning ball bearings. Legs high enough for 25-lb. paper bag to be filled. Galvanized for the prevention of rust. ¾ HP. motor. Direct drive, no gears. Shelf for placing ice on before entering hopper. Slanting hopper for easy loading. Four grate adjustments by turning the handle on side of crusher. Makes a very good fine ice on grate closed. Will take long 50-lb. blocks in hopper. Two belts for sure pulling power. Belts and motor pulley furnished when crusher is ordered without motor. Delivery can be made on receipt of order. Guard covers the flywheel and motor pulley.

Price $149.00, less motor. Motor at prevailing price.

Write For Full Information

Bateman *Ice Processing Equipment*

MINERAL WELLS, TEXAS

MANUFACTURERS' NEWS

Link-Belt Completes Second New Plant Within a Year

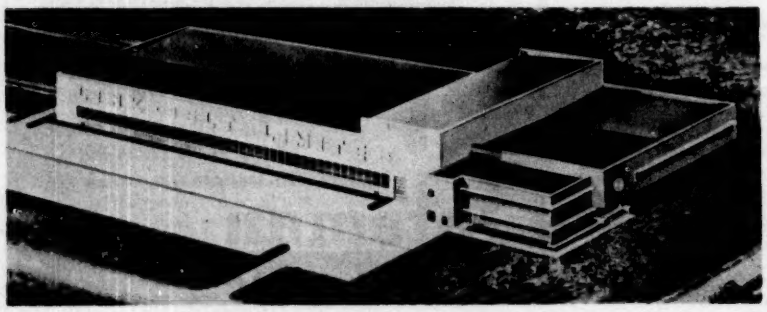
MORE than 500 civic leaders, engineers and industrialists visited the new Scarboro, Ont., plant of Link-Belt Limited, located on Canada's mushrooming "Golden Mile of Industry," about 10 miles northeast of downtown Toronto June 29. Their visit marked the official opening of a 72,000-square-foot Link-Belt engineering plant for the design and manufacture of conveying and processing equipment.

Last December, the parent company, Link-Belt Company, put in operation a 300,000-square-foot plant at Colmar, Pa., about 25 miles north of Philadelphia. Thus the new Scarboro plant is the second Link-Belt plant to open within a year. It becomes the company's 18th plant.

Steel fabrication and the heavier assembly work have been moved to the Scarboro plant, where materials handling systems for Canadian customers are now being fabricated. This increases the capacity of the company's plant on Eastern Avenue in Toronto for the production of conveyor and power transmission components.

Headquarters for the Canadian company, including general offices, engineering, purchasing, order, accounting and Ontario district sales, are now located at the Scarboro plant. Besides the plants at Scarboro and Toronto, Link-Belt Limited has a gray iron foundry at Elmira, Ont.; company-operated factory branch stores at Montreal, Swatika (Ont.), Winnipeg and Vancouver; and a sales office at Hamilton.

The plant has two longitudinal production bays, each 60 feet wide and 280 feet long, with 36-foot clearance below trusses. A transverse receiving bay, 60 feet by 140 feet, has overhead clearance of 45 feet. Each production bay is equipped with two overhead traveling cranes. A single crane is located in the transverse bay. Spurs from the Canadian Pacific Railway run directly into the plant. The modern two-story office building is air conditioned and includes a cafeteria and medical dispensary.



New Link-Belt plant at Scarboro, Ont., Canada.

Barry League Southern Mojonnier Representative

THE appointment of Barry League as sales representative in the South has been announced by Majonnier Bros., Chicago, manufacturers of food processing equipment. Mr.

Barry League

League has been serving the food industry in the Carolinas since World War II. During the War he served with the First Armored Division and the Fifth Army Headquarters in both the African and European Theatres. He will be located at Charlotte, N. C., 1328 Skylind Road, Phone 4-8897.

Worthington Appointment

THE appointment of O. B. Wert of Danville as manager of the technical data and training section of the air conditioning and refrigeration division of Worthington Corp., Harrison, N. J. has been announced. Mr. Wert will have the responsibility of price manuals, data books, application manuals and similar education material.

Wade New CP Export Manager

ROBERT J. WADE, JR., has been named Export Manager for The Creamery Package Mfg. Company, Chicago, according to a recent announcement by James L. Brazee, vice-president in charge of sales.

Robert J. Wade, Jr.

"Bob" Wade was born in Oak Park, Ill., where he received his elementary education. He majored in Mechanical Engineering at Purdue University where he also distinguished himself as a varsity football player.

In 1933 Bob joined his father's firm, R. J. Wade & Co., which specialized in the repair of dairy equipment. CP's research and development department claimed his services in 1939. After three years, he was assigned to the Chicago branch as a sales engineer. In January of 1949, he became the sales engineer for the CP export department. Since December 1952, he has been acting export manager for Creamery Package.

Johnson, Morrell Superintendent Resigns

THE resignation of Ellwood L. Johnson, mechanical superintendent of the Ottumwa plant of John Morrell & Co., has been announced, effective July 18. He has been mechanical superintendent since May 1, 1941.

Mr. Johnson, who graduated from the University of Minnesota with a bachelor of science degree in mechanical engineering in 1930, joined the Morrell firm shortly thereafter, so has a 23-year service record with the company. He was assistant master mechanic at the Sioux Falls, S.D., plant from July, 1930, until October, 1933, when he assumed the same position in Ottumwa. Four years later he was named chief engineer of the Topeka, Kans., plant then operated by the firm, and remained there until transferred to Ottumwa as mechanical superintendent in May, 1941.

He is a member of the Rotary Club, the National Association of Power Engineers, the Elks and the Ottumwa Country Club.

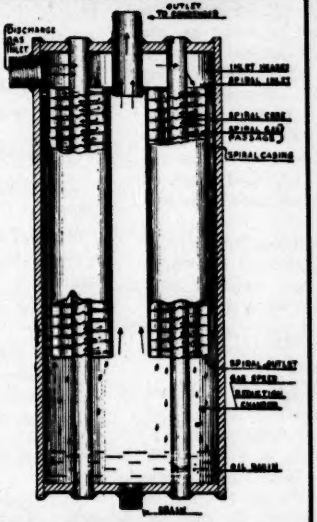
"King Zeero"

OIL SEPARATOR

STOPS OIL FROM ENTERING CONDENSER RECEIVER AND LOW SIDE

Allows operation as was originally intended. Simple in operation — no parts to wear out — no screens, metal wool or any close screens to clog, raise discharge pressures and cut down capacity.

When used in connection with air compressors, water is also separated with the oil.



Built for years of trouble free service. Mechanical details on request.

THE KING ZEERO COMPANY

General Office and Plant No. 1 — 1447 S. W. Montrose Ave., Chicago 53, Ill.

Plant No. 2 — 4300-14 W. Montrose Ave., Chicago 41, Ill.

SERVING THE ICE INDUSTRY FOR 20 YEARS

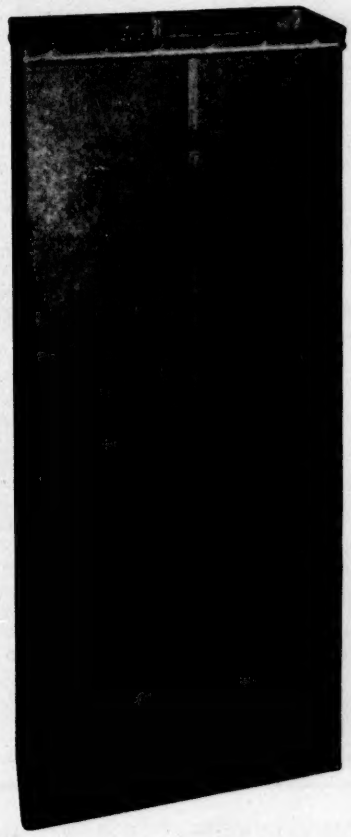
Dependable . . Automatic . . Refrigerated

S&S ICE VENDING STATIONS AND ICE VENDING EQUIPMENT

Sold by Leading Ice Equipment Distributors Throughout The Nation

S&S Vending Machine Co.

670 LINCOLN AVE., SAN JOSE, CALIFORNIA



Welded Cans
Integral Tube Cans
Arctic Pownall Cans
Can Baskets
Condenser Trough

• • • • • • • • • • •

Industrial Trucks and Trailers

THE OHIO GALVANIZING & MFG. CO.

NILES OHIO

In announcing his resignation, Mr. Johnson declined to outline his future plans other than to indicate that he and Mrs. Johnson and their son, David, 19, would go to California.

Taking Mr. Johnson's place is Ross E. Kluckhohn. Mr. Kluckhohn, a native Iowan, received the bachelor of science degree in mechanical engineering from Iowa State College in 1930. He has been with Morrell 15 years, occupying various positions, the most recent of which was divisional superintendent. He assumed his new duties with Morrell July 18.

Kold-Hold Changes Name To Tranter Mfg. Company

THE Kold-Hold Manufacturing Company, Lansing, Mich., manufacturer of refrigeration equipment and products in the industrial and domestic heating fields, has announced a change in its corporate name to Tranter Manufacturing, Inc., effective at once.

The change was voted by stockholders who felt that the Kold-Hold name was made inappropriate as the result of a well-established product diversification program. The 22-year-old program is also regarded as being the country's leading authority in the use of the hydrogen brazing process for fabricating metal parts.

James R. Tranter, Kold-Hold president and general manager who will continue in the same capacities in the company that now bears his name, pointed out that the name change will have no effect on ownership of the company or its corporate structure. The original Kold-Hold product now represents less than a tenth of the total business of the company, he said. Kold-Hold was founded in 1931 by the late Ransom E. Olds, founder of the Oldsmobile and Reo motor car companies. Its sole product in the beginning was the "Hold-Over" truck refrigeration plate. Controlled stock in the company was purchased by Mr. Tranter in 1937.

A Platecoil Division has been established to manufacturer and merchandise Platecoil process heating and cooling plates, which were developed by the company about five years ago as replacements for pipe coils in a wide variety of industries.

The Contract Division will continue to manufacture complete products and components for other manufacturers. Included in this group is a complete line of radiant heat baseboards, condensers, static condensers, evaporators and other components for the air conditioning and refrigeration fields.

Tranter Manufacturing is also engaged in sizeable defense work as a prime contractor, and a separate division has been set up for this phase of the company's activities.

New Vending Installations

The following companies have announced installation of modern ice vending equipment, supplied by the S & S Vending Machine Co.

Detroit City Ice & Fuel, Pontiac, Mich.

Maddox Ice Co., Denver, Colo.

Crystal Ice & Cold Storage Co., Phoenix, Ariz.

Lansdale Ice & Storage Co., Lansdale, Pa.

Arch Nance Co., Warren, Ohio

Thomas Rawley Co., Middlefield, Ohio

Crystal Ice Co., Montreal, Canada

City Products Corp., Cleveland, Ohio

Hilltop Packing Co., Huntingburg, Ind.

Brest Packing Co., Shamakin, Pa.

Gadsden Ice & Fuel, Gadsden, Ala.

Cirillo Bros., Brooklyn, N. Y.

Independence Ice Co., Ardmore,. Okla.

United Oil & Gas Co., South Bend, Ind.

Hartford Ice & Coal Co., Montpelier, Ind.

City Products Corp., Grand Rapids, Mich.

Ice Products Co., Steubenville, Ohio

City Products Corp., Flint, Mich.

John Alexander Co., Riverside, N.J.

Windsor Dist. Co., Hamburg, Pa.

LILLY ICIZER
Model 23CE12 with "V" Feeder

This Model ICIZER will size 25-35 tons per hour. Lilly "V" Feeder shown feeds full blocks into breaker.

Other models for large and small plants.

more profits this summer
with a LILLY ICIZER

Sized ice is your biggest money maker . . . and a Lilly Ice Sizing unit is your best bet for easier, more economical, trouble-free production. Lilly Icizers offer superior advantages throughout, with—

- Precision Adjustable Breaker
- Bucket type elevator—no scraping or grinding of ice
- Rubber wheel sanitary screen drive
- Positive Feed spiral screens
- Bag height bins—faster filling

—and there's a standard model Lilly Ice Sizer for every size plant.

Boost your profits this summer. Write today for Lilly Catalog No. 303 and get full details on Lilly Sizing and crushing equipment. *No obligation.*

Package Your Ice in
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SUPPLIES — EQUIPMENT
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- Crushers

A complete line of supplies and equipment for the ice industry.

Sell more ice...
Do a better icing job

A LINK-BELT Ice Crusher-Slinger opens up new markets

Every shipper of perishable products is a potential customer if you have a Link-Belt Ice Crusher-Slinger. This modern method of top-icing helps bring a better price for the product at market, because spoilage is reduced.

Get all the facts about the Link-Belt Ice Crusher-Slinger. Capacities 15 to 60 tons per hour. Stationary or portable. Electric or gasoline driven.

Portable Link-Belt Ice Crusher-Slinger delivers snow-ice to tops of and between crates of celery. Profitable year 'round business can be built with a small investment.

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WRITE FOR BOOK 2382
for all the facts

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12.300-A

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KNICKERBOCKER STAMPING COMPANY

PARKERSBURG, W. VA.

Warren Eviston Co., Fort Wayne, Indiana.
Ebner Ice & Cold Storage Co., Crothersville, Indiana.
Pearl Packing Co., Madison, Indiana.
W & L Sales Co., Harrisburg, Pa.
Carl Johnson, Waverly, Ohio.
City Products Corp., Columbus, Ohio.
City Products Corp., Buffalo, N. Y.
City Products Corp., Pittsburgh, Pa.
Pure Ice Co., Daytona Beach, Florida.
Central Power & Light Co., Corpus Christi, Texas.
James Hannah Co., Ivanhoe, California.
Thomas Stack, Harristown, Pa.

CATALOGS AND BULLETINS

New Company Magazine

DEEP WATERS is the intriguing name of a new bi-monthly company magazine being published by Layne & Bowler, Inc., and the Layne Associates Companies. Printed in color and liberally illustrated, it carries unusual stories about water, articles on water development, and features with a water angle. One page in each issue sure to attract favorable attention is devoted to a photograph of Miss Deep Waters. Anyone connected with or interested in water development will be placed on the mailing list by request to A. O. Putnam, Editor, Box 6697, Memphis 8, Tenn.

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DID YOU KNOW...

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and obviously into your newer, high speed machines, too!

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if you want peak performance . . . increased efficiency . . . greater output . . . lower power costs with utmost safety, investigate the advantages of VOSS VALVES for your machines.

VOSS VALVES provide . . . Quiet, vibration-free operation • 20 to 60% more valve area • less power consumption • low pressure loss • normal discharge temperature • lower operating costs • utmost safety.

To increase the efficiency of your compressor, send us the name, bore, stroke and speed of your machine. Our detailed proposal will be sent without obligation.

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Air Conditioning Bulletin

A BULLETIN on air conditioning has been issued by the Trane Company, La Crosse, Wisc. It consists of illustrated descriptions of four major air conditioning projects: the Central Y.M.C.A., Oklahoma City; the Community Hospital at Evanston, Ill.; Parkman Stores, Nashville, Tenn.; and the Point Breeze Works of Western Electric at Baltimore, Md. Refrigeration operating controls are illustrated and described.

Bulletin On Liquid Foils

A BULLETIN describing Permalume Liquid Foils, which are now available for general use has been issued by Grems Manufacturing Co., Klamath Falls, Ore. Metallic liquid foils, it explains, are of value in the air conditioning and refrigerating field because of their ability to lower roof temperatures by as much as 50 to 60 F. This reduces loads on air conditioning and refrigeration equipment.

Fiberglas Duct Insulation

A 16-PAGE design data booklet issued by Owens-Corning Fiberglas Corp. contains more than 40 photographs and drawings of the various rigid and flexible Fiberglas insulations for the exterior and interior of cold and warm air ducts. In addition, it has information about the new flexible duct liner manufactured by the company.

Welding Aluminum

A NEW and enlarged edition of a manual on welding aluminum published in 1946 has been issued by Reynolds Metals Company, Pittsburgh, Pa. The revised manual, with 186 pages, contains material on 34 processes suitable for welding, brazing and soldering aluminum and its alloys.

Low Temperature Insulation

A 24-PAGE bulletin by Pittsburgh Corning Corp. Pittsburgh, Pa. contains numerous application methods of Foamglas for insulating ceilings, walls and floors.

Vertical Turbine Pumps

A BULLETIN has been issued by Worthington Corporation, Harrison, N. J. recommending vertical turbine pumps for a variety of applications. A special point is made of the fact that this type of pump requires a minimum of floor space.

THE BUYERS DIRECTORY

INDEX TO ADVERTISEMENTS OF THESE FIRMS—PAGE 72

ABSORBERS
Vogt Machine Co., Henry, Louisville, Ky.

AIR CONDITIONING EQUIPMENT
Carrier Corp., Syracuse, N. Y.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Niagara Blower Co., New York, N. Y.

AMMONIA COMPRESSOR VALVES
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Voss, Inc., J. H. H., New York, N. Y.

AMMONIA COMPRESSORS
Creamery Package Mfg. Co., Chicago, Ill.
Dersch, Gesswein & Neuert, Inc. Chicago, Ill.
Enterprise Equipment Corp., Yonkers, N. Y.
Frick Co., Waynesboro, Pa.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

AMMONIA CONTROL DEVICES
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.

AMMONIA FLOAT VALVES
Acme Industries, Inc., Jackson, Mich.
Armstrong Machine Works, Three Rivers, Mich.
Frick Co., Waynesvoro, Pa.
Phillips & Co., H. A., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

AMMONIA MANUFACTURERS
Armour Ammonia Div., Armour & Co., Chicago, Ill.
Bower Chemical Mfg. Co., Henry Philadelphia, Pa.
du Pont de Nemours & Co., Inc., E. I., Polychemicals Dept., Wilmington, Del.
Nitrogen Div., Allied Chemical & Dye Corp., New York, N. Y.

AMMONIA PURIFIERS
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
International Salt Co., Inc., Scranton, Pa.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

AMMONIA RECEIVERS
Acme Industries, Inc., Jackson, Mich.
Creamery Package Mfg. Co., Chicago, Ill.
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Enterprise Equipment Corp., Yonkers, N. Y.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

AMMONIA VALVES & FITTINGS
Dersch, Gesswein & Neuert, Inc. Chicago, Ill.
Frick Co., Waynesboro, Pa.
Shank Co., Cyrus, Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

ARCHITECTS AND ENGINEERS
Greene, Van R. H., New York, N. Y.
Ophuls & Associates, Fred, New York, N. Y.

ASPHALT PRODUCTS
American Bitumuls & Asphalt Co. San Francisco, Calif.

AUTOMATIC CONTROL DEVICES
Alco Valve Co., St. Louis, Mo.
Armstrong Machine Works, Three Rivers, Mich.
Frick Co., Waynesboro, Pa.
Phillips & Co., H. A., Chicago, Ill.
Rex Engineering & Sales Co., Oklahoma City, Okla.
Sporlan Valve Co., St. Louis, Mo.
York Corp., York, Pa.

BAGS, ICE
Index Coupon & Supply Co., La Porte, Ind.
Union Bag & Paper Corp., New York, N. Y.

BAGS, WATERPROOF PAPER
Index Coupon & Supply Co., La Porte, Ind.
Union Bag & Paper Co., New York, N. Y.

BEER COOLERS
Frick Co., Waynesboro, Pa.
Martocello & Co., Jos. A., Philadelphia, Penna.
Vogt Machine Co., Henry, Louisville, Ky.

BLOWERS
Frick Co., Waynesboro, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

BOILERS
Vogt Machine Co., Henry, Louisville, Ky.

BOILER TUBES
Byers Co., A. M., Pittsburgh, Pa.

BOOKS—TECHNICAL
Nickerson & Collins Co., Chicago, Ill.

BRINE CIRCULATORS
Creamery Package Mfg. Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Reynolds Mfg. Co., Springfield, Mo.
Roots-Connersville Blower Corp., Connersville, Ky.
York Corp., York, Pa.

BRINE COOLERS
Acme Industries, Inc., Jackson, Mich.
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Enterprise Equipment Corp., Yonkers, N. Y.
Frick Co., Waynesboro, Pa.
Reynolds Mfg. Co., Springfield, Mo
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

BRINE SPRAY COOLING
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Permamix-C for patching in temperatures from 5° above to 30° below zero.

DRY TAMP MEANS SPEED • No sticky mass to dig out of the drum or to handle • Permamix dry pours • sets instantly • feather edges perfectly • no production delays • non-skid surface.

ALL TEMPERATURE • Won't freeze • can be stored or used in *any* temperature • will store indefinitely • a stock room item • will not "set" in drum whether open or covered. Mistakes just can't happen. Tamp in place and traffic rolls.

CUTS MAINTENANCE COSTS on concrete, brick, tile or asphalt floors • no special equipment or skill needed • a one man job • comes in durable 50 lb. net wt. fibre drums • solve your floor patching problems for good.

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RIGHT EQUIPMENT and **SKILL** to bend pipe, build coils or headers in any form, of any metal, including stainless steel. Fabricated to your exact specifications. We even bend pipe up to 6-inch extra heavy! Complete welding facilities. For extra-fine quality custom work, call us.

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Anhydrous Ammonia
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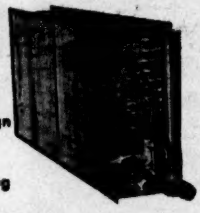
For **Refrigeration, Air Conditioning, and Heating**

Rempe Coils are accepted in the industry as quality equipment that is built for long service without maintenance. Rempe Coils are used on the most difficult jobs and forgotten. This confidence has been earned the hard way—through proper engineering, good quality materials and precision manufacturing.



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Send us your problems for engineering assistance.

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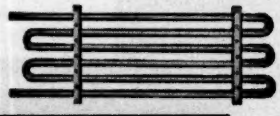

REMPE COMPANY
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THE BUYERS

INDEX TO ADVERTISEMENTS OF THESE FIRMS—PAGE 72

BRINE TREATMENT
International Salt Co., Inc., Scranton, Pa.

CALCIUM CHLORIDE
Solvay Process Div., The Allied Chemical & Dye Corp., New York, N. Y.

CAN DUMPS
Frick Co., Waynesboro, Pa.
Gifford-Wood Co., Hudson, N. Y.
Ohio Galvanizing & Mfg. Co., Niles, Ohio
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

CANVAS COVERS
Vivian Mfg. Co., St. Louis, Mo.

CAR ICING EQUIPMENT
Gifford-Wood Co., Hudson, N. Y.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
Tri-Pak Machinery Service Inc., Harlingen, Tex.

CHEMICALS
Barada & Page, Inc., Kansas City, Mo.

COILS
Acme Industries, Inc., Jackson, Mich.
Byers Co., A. M., Pittsburgh, Pa.
Chicago Nipple Mfg. Co., Chicago, Ill.
Creamery Package Mfg. Co., Chicago, Ill.
Detroit Ice Machine Co., Detroit, Mich.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

COLD STORAGE CONSTRUCTION
Armstrong Cork Co., Lancaster, Pa.
Frick Co., Waynesboro, Pa.
Rubatex Div., Great American Industries, Inc., New York, N. Y.

COLD STORAGE DOORS
Butcher Boy Refrigerator Door Co., Harvard, Ill.
Jamison Cold Stge. Door Co., Hagerstown, Md.
Refrigeration Engineering Co., Montgomery, Minn.

COMPRESSORS
(See Ice Making and Refrigerating Machinery)

COMPRESSOR VALVE PLATES AND DISCS
Frick Co., Waynesboro, Pa.
Voss, Inc., J. H. H., New York, N.Y.

COMPRESSOR VALVES
Frick Co., Waynesboro, Pa.
Voss, Inc., J. H. H., New York, N.Y.

CONDENSERS
Acme Industries, Inc., Jackson, Mich.
Creamery Package Mfg. Co., Chicago, Ill.
Enterprise Equipment Corp., Yonkers, N. Y.
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
King-Zeero Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

CONSULTING ENGINEERS
Greene, Van R. H., New York, N. Y.
Ophuls & Associates, Fred, New York, N. Y.

CONTROLLING INSTRUMENTS
Taylor Instrument Cos., Rochester, N. Y.

CONVEYORS
Gifford-Wood Co., Hudson, N. Y.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.

CORK INSULATION
Armstrong Cork Co., Lancaster, Pa.
United Cork Companies, Kearny, N.J.

CORROSION CONTROL
Wright Chemical Corp., Chicago, Ill.

COUPON BOOKS
Index Coupon & Supply Co., La Porte, Ind.
Vivian Mfg. Co., St. Louis, Mo.

COVERINGS (PIPE AND BOILERS)
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CYLINDERS (GAS & LIQUID)
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DIP TANKS
Frick Co., Waynesboro, Pa.

DIP TANKS AND CAN BASKETS
Knickerbocker Stamping Co., Parkersburg, W. Va.
Ohio Galvanizing & Mfg. Co., Niles, Ohio
Vogt Machine Co., Henry, Louisville, Ky.

DRIVES, TRANSMISSIONS
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Link-Belt Co., Chicago, Ill.

ELEVATING & CONVEYING MACHINERY
Gifford-Wood Co., Hudson, N. Y.
Lewis-Shepard Products, Inc., Watertown, Mass.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.

ENGINEERS AND ARCHITECTS
(See Architects and Engineers)

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Caterpillar Tractor Co., Peoria, Ill.

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Frick Co., Waynesboro, Pa.
Niagara Blower Co., New York, N. Y.

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Acme Industries, Inc., Jackson, Mich.
Creamery Package Mfg. Co., Chicago, Ill.
Niagara Blower Co., New York, N. Y.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

DIRECTORY

INDEX TO ADVERTISEMENTS OF THESE FIRMS—PAGE 72

FEED-WATER HEATERS
National Pipe Bending Co., New Haven, Conn.
Vogt Machine Co., Henry, Louisville, Ky.

FIBERGLAS
Armstrong Cork Co., Lancaster, Pa.

FIELD ICE SAWS
Gifford-Wood Co., Hudson, N. Y.

FILTERS, WATER
York Corp., York, Pa.

FIN COILS
Acme Industries, Inc., Jackson, Mich.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
York Corp., York, Pa.

FITTINGS
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Henry Valve Co., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

FLOAT VALVES
Frick Co., Waynesboro, Pa.

FLOOR PATCHING
Permamix Corp., Chicago, Ill.

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Howe Ice Machine Co., Chicago, Ill.

FROZEN FOOD LOCKERS
Knickerbocker Stamping Co., Parkersburg, W. Va.

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Niagara Blower Co., New York, N. Y.

HYGROMETERS
Taylor Instrument Cos., Rochester, N. Y.

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Union Bag & Paper Corp., New York, N. Y.
Vivian Mfg. Co., St. Louis, Mo.

ICE BLOWERS
Gifford-Wood Co., Hudson, N. Y.
Link-Belt Co., Chicago, Ill.

ICE CANS
Ice plant Equipment Co., Inc., Philadelphia, Pa.
Knickerbocker Stamping Co., Parkersburg, W. Va.
Ohio Galvanizing & Mfg. Co., Niles, Ohio

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Knickerbocker Stamping Co., Parkersburg, W. Va.
Ohio Galvanizing & Mfg. Co., Niles, Ohio
Vogt Machine Co., Henry, Louisville, Ky.

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Vivian Mfg. Co., St. Louis, Mo.

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Link-Belt Co., Chicago, Ill.

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Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
Refrigeration Engineering Co., Montgomery, Minn.

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Bateman Foundry & Machine Co. Inc., Mineral Wells, Texas
Gifford-Wood Co., Hudson, N. Y.
Index Coupon & Supply Co., La Porte, Ind.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
Micron, Inc., Bettendorf, Iowa
Tri-Pak Machinery Service Inc., Harlingen, Tex.
Vivian Mfg. Co., St. Louis, Mo.

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Index Coupon & Supply Co., La Porte, Ind.
Lilly Co., The, Memphis, Tenn.
Union Bag & Paper Co., New York, N. Y.
Vivian Mfg. Co., St. Louis, Mo.

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Ice plant Equipment Co., Inc., Philadelphia, Pa.
Vivian Mfg. Co., St. Louis, Mo.

ICE CUBING MACHINES
Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc. Philadelphia, Pa.
Lilly Co., The, Memphis, Tenn.

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Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
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Lilly Co., The, Memphis, Tenn.
Union Bag & Paper Corp., New York, N. Y.
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ICE MAKING AND REFRIGERATING MACHINERY
Carrier Corp., Syracuse, N. Y.
Creamery Package Mfg. Co., Chicago, Ill.
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Detroit Ice Machine Co., Detroit, Mich.
Enterprise Equipment Corp., Yonkers, N. Y.
Frick Company, Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
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Reynolds Mfg. Co., Springfield, Mo.
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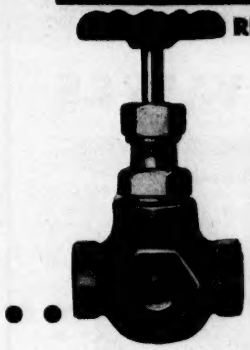
York Corp., York, Pa.

shank AMMONIA VALVES AND REFRIGERATION PRODUCTS



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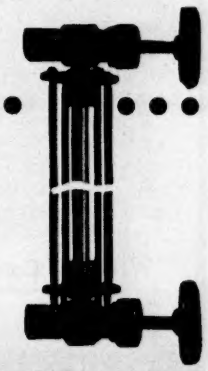

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All-Steel Construction. Automatic shut-off of liquid in case of glass breakage. Composition packing rings give long life, no-leak seal.

If your jobber doesn't stock—write

CYRUS SHANK CO.
629 W. Jackson Blvd. Chicago 6, Ill.

For 70 years

NATIONAL QUALITY

this mark has meant to users of NATIONAL Refrigeration Coils smooth bends perfect welds accurate measurements effective service

Write for our free tracing-chart, whether you need zig-zag or nested box or conical or round-flat or reducing coils. NATIONAL QUALITY also is standard in Heaters, Convectors and Heat Exchangers.

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162 RIVER ST. • NEW HAVEN, CONN.

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VALVES
SINCE 1880

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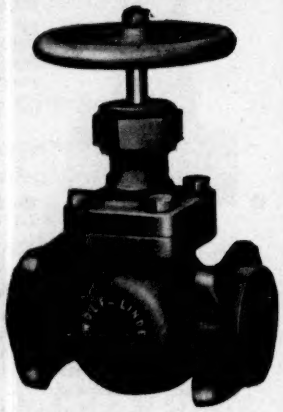

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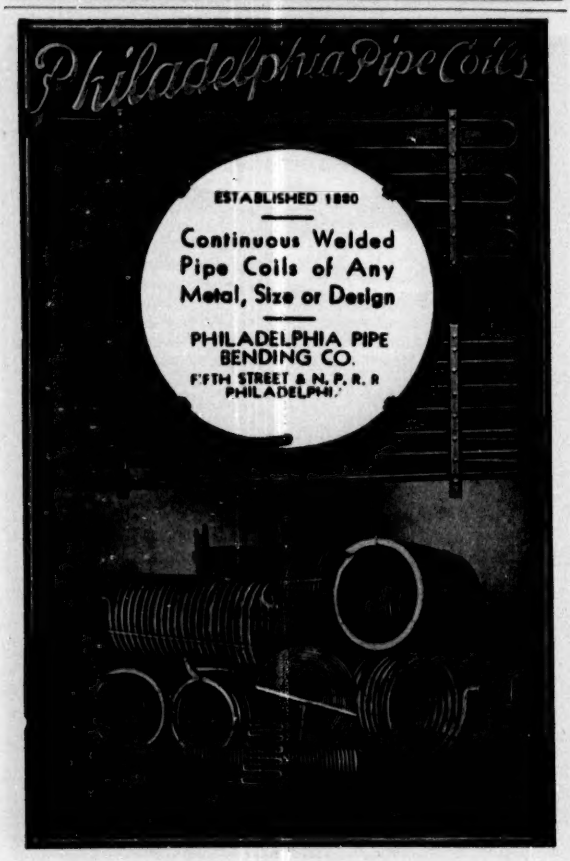
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INDEX TO ADVERTISEMENTS OF THESE FIRMS—PAGE 72

ICE PICKS AND PLANERS
Gifford-Wood Co., Hudson, N. Y.
Index Coupon & Supply Co., La Porte, Ind.
Lilly Co., The, Memphis, Tenn.
Vivian Mfg. Co., St. Louis, Mo.

ICE PICK SCABBARDS
Gifford-Wood Co., Hudson, N. Y.
Index Coupon & Supply Co., La Porte, Ind.
Lilly Co., The, Memphis, Tenn.
Vivian Mfg. Co., St. Louis, Mo.

ICE PLANTS
Enterprise Equipment Corp., Yonkers, N. Y.
Frick Co., Waynesboro, Pa.

ICE SCALES
Conveyor Co., The, Los Angeles, Calif.
Gifford-Wood Co., Hudson, N. Y.
Index Coupon & Supply Co., La Porte, Ind.
Lilly Co., The, Memphis, Tenn.
Vivian Mfg. Co., St. Louis, Mo.

ICE TOOLS
Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Index Coupon & Supply Co., La Porte, Ind.
Lilly Co., The, Memphis, Tenn.
Vivian Mfg. Co., St. Louis, Mo.

ICE VENDING KITS
Refrigeration Engineering Co., Montgomery, Minn.

ICE VENDORS
Frick Company, Waynesboro, Pa.
Jamison Cold Storage Door Co., Hagerstown, Md.
Refrigeration Engineering Co., Montgomery, Minn.
S & S Vending Machine Co., San Jose, Calif.
Vivian Mfg. Co., St. Louis, Mo.

INDICATING INSTRUMENTS
Taylor Instrument Cos., Rochester, N. Y.

INSTANTANEOUS HEATERS
National Pipe Bending Co., New Haven, Conn.

INSULATING MATERIALS
Armstrong Cork Co., Lancaster, Pa.
Dow Chemical Co., Plastics Dept., Midland, Mich.
Pacific Lumber Co., San Francisco, Calif.
Pittsburgh Corning Corp., Pittsburgh, Pa.
Rubatex Div., Great American Industries, Inc., New York, N. Y.
United Cork Companies, Kearny, N.J.

INSULATION ADHESIVES
American Bitumuls & Asphalt Co. San Francisco, Calif.

LIFT TRUCKS
Lewis-Shepard Products, Inc., Watertown, Mass.

LOW TEMPERATURE EQUIPMENT
(See Ice Making and Refrigerating Machinery)

MATERIALS HANDLING EQUIPMENT
Ohio Galvanizing & Mfg. Co., Niles, Ohio

OIL AND LUBRICANTS
Frick Co., Waynesboro, Pa.
Sun Oil Co., Philadelphia, Pa.
Texas Co., The, New York, N. Y.

OIL SEPARATORS
Frick Co., Waynesboro, Pa.
King-Zeero Co., Chicago, Ill.
Rex Engineering & Sales Co., Oklahoma City, Okla.

OILS, CUTTING
Sun Oil Co., Philadelphia, Pa.
Texas Co., The, New York, N. Y.

OILS, FUEL
Sun Oil Co., Philadelphia, Pa.
Texas Co., The, New York, N. Y.

PACKINGS
Frick Company, Waynesboro, Pa.
Vivian Mfg. Co., St. Louis, Mo.
York Corp., York, Pa.

PIPE COILS AND BENDS
Acme Industries, Inc., Jackson, Mich.
Chicago Nipple Mfg. Co., Chicago, Ill.
Frick Company, Waynesboro, Pa.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

PIPE WELDING
Acme Industries, Inc., Jackson, Mich.
Frick Co., Waynesboro, Pa.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

PIPING
Acme Industries, Inc., Jackson, Mich.
Byers Co., A. M., Pittsburgh, Pa.
Frick Company, Waynesboro, Pa.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

PRESSURE BLOWERS
Roots-Connersville Blower Corp., Connersville, Ind.

PRESSURE REGULATORS
Taylor Instrument Cos., Rochester, N. Y.

PUMPING MACHINERY
Roots-Connersville Blower Corp., Connersville, Ind.

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PUMPS, AMMONIA AND BRINE
Frick Company, Waynesboro, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

DIRECTORY

INDEX TO ADVERTISEMENTS OF THESE FIRMS—PAGE 72

PUMPS, ROTARY
Roots-Connersville Blower Corp., Connersville, Ind.

PURGERS
Armstrong Machine Works, Three Rivers, Mich.
Frick Company, Waynesboro, Pa.
Rex Engineering & Sales Co., Oklahoma City, Okla.
York Corp., York, Pa.

RAW WATER FREEZING SYSTEMS
Frick Co., Waynesboro, Pa.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

REBOILERS
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

RECORDING THERMOMETERS
Taylor Instrument Cos., Rochester, N. Y.

REFRIGERATED ICE STATIONS
Refrigeration Engineering Co., Montgomery, Minn.
S & S Vending Machine Co., San Jose, Calif.

REFRIGERATING AND ICE MAKING MACHINERY
(See Ice Making and Refrigerating Machinery)

RUST PREVENTATIVES
Bower Chemical Mfg. Co., Henry Philadelphia, Pa.
Wright Chemical Corp., Chicago, Ill.

SCORING MACHINES
Frick Company, Waynesboro, Pa.
Gifford-Wood Co., Hudson, N. Y.
Lilly Co., The, Memphis, Tenn.
Perfection Ice Scoring Machine Co., Fort Worth, Texas

SECOND HAND MACHINERY
Enterprise Equipment Corp., Yonkers, N. Y.

SEPARATORS OIL, STEAM AND AMMONIA
Acme Industries, Inc., Jackson, Mich.
Frick Company, Waynesboro, Pa.
King-Zeero Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

SHOULDER PADS
Gifford-Wood Co., Hudson, N. Y.
Index Coupon & Supply Co., La Porte, Ind.
Lilly Co., The, Memphis, Tenn.
Vivian Mfg. Co., St. Louis, Mo.

SIZED ICE EQUIPMENT
Bateman Foundry & Machine Co., Inc., Mineral Wells, Texas
Gifford-Wood Co., Hudson, N. Y.
Lilly Co., The, Memphis, Tenn.
Vivian Mfg. Co., St. Louis, Mo.

STORAGE HEATERS
National Pipe Bending Co., New Haven, Conn.

TANKS
Frick Company, Waynesboro, Pa.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

TARPAULINS
Index Coupon & Supply Co., La Porte, Ind.
Lilly Co., The, Memphis, Tenn.
Vivian Mfg. Co., St. Louis, Mo.

THERMOMETERS
Taylor Instrument Companies, Rochester, New York

THERMOMETERS, RECORDING
Taylor Instrument Cos., Rochester, N. Y.

TIERING MACHINES
Gifford-Wood Co., Hudson, N. Y.

TRAPS, OIL & STEAM
Armstrong Machine Works, Three Rivers, Mich.
Rex Engineering & Sales Co., Oklahoma City, Okla.

UNIT COOLERS
Acme Industries, Inc., Jackson, Mich.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Niagara Blower Co., New York, N. Y.

USED MACHINERY
Enterprise Equipment Corp., Yonkers, N. Y.

VALVES AND FITTINGS
Alco Valve Co., St. Louis, Mo.
Frick Company, Waynesboro, Pa.
Henry Valve Co., Chicago, Ill.
Ice plant Equipment Co., Inc., Philadelphia, Pa.
Phillips & Co., H. A., Chicago, Ill.
Shank Co., Cyrus, Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.
York Corp., York, Pa.

VALVES, COMPRESSOR
Frick Co., Waynesboro, Pa.
Voss, Inc., J. H. H., New York, N.Y.

WATER COOLERS
Acme Industries, Inc., Jackson, Mich.
Frick Co., Waynesboro, Pa.
Niagara Blower Co., New York, N. Y.
Vogt Machine Co., Henry, Louisville, Ky.

WATER TREATMENT MATERIALS
Barada & Page, Inc., Kansas City, Mo.
International Salt Co., Inc., Scranton, Pa.
Wright Chemical Corp., Chicago, Ill.

WELDING
Frick Company, Waynesboro, Pa.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Vilter Mfg. Co., Milwaukee, Wis.
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MONTGOMERY MINNESOTA

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Save TIME-TROUBLE-MONEY

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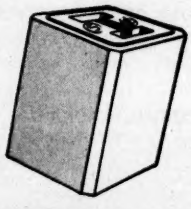

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For Reliability and Economy

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REPLACEMENTS FOR *ALL* CLEAR RAW WATER ICE MAKING SYSTEMS, INCLUDING MARTOCELLO, MADE FROM THE ORIGINAL ENGINEERING DRAWINGS AND PATTERNS. ALSO REPLACEMENTS FOR YORK AND FRICK SYSTEMS.

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STOCK ORDERS SHIPPED SAME DAY THEY ARE RECEIVED.

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ICE PLANT EQUIPMENT CO., Inc.
2543 Frankford Avenue — Nebraska 4-3055
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FOR SALE—Complete Frick 35 ton ice plant, 504 cans, tank, shell & tube condensors, 12x12 compressor, 150 h.p. Diesel engine directly connected with 75 KW generator, coils, etc. To be moved immediately from El Dorado, Arkansas. Liberal terms to right party. Write or phone Alphin Ice & Cold Storage Co., El Dorado, Ark. Phone 3-8680.

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20 tons to 150 tons.

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12½x14½ York, ⅓ & ⅔ capacity control.
10x10 York, 300 r.p.m.
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6x6 York high speed, 3x3 York, self contained unit.
11½x8 Frick Booster compressor, V-belt drive, to 50 h.p. motor.

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JOHN F. CARSON
"A" & Venango Sts. Philadelphia 34, Pa.
Phone GArfield 6-2221

WANTED TO BUY—Ice cans 11½x22½x48, inside diameter. Must be in good condition. Valley Ice & Bottling Company, Dermott, Arkansas.

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2 large activated carbon Pur Air air purifiers as manufactured by American Solvent Recovery Corp., Columbus, Ohio. These machines have been used 3 years and are guaranteed in perfect condition. Inspection invited. Jackson Ice & Cold Storage Co., Jackson, Ohio, Phone 258.

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FOR SALE—3x3, 4x4, 5x5 self contained Yorks. 4x4, 7½x7½, 8x8, 9x9 Yorks splash lubrication. 15 ton Acme shell & tube condenser. Receivers, all sizes. One 15 h.p. Freon compressor. Write E. Niebling, 1546 St. Clair Ave. Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE
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Complete ice plants—10-50 ton.
Ammonia compressors—all sizes.
Valves and fittings.
Condensers, brine coolers, ice cans.

B & E REFRIGERATING CO.
2 ORANGE ST., NEWARK 2, N. J.
Phone: MItchell 3-7790 Cable address "BERECO"

FOR SALE—One 6x6 York compressor complete with receiver and V-belts. One electric motor 15 h.p. One pump and motor 3 h.p. One brine pump. One 15 h.p. starter box. Contact Mr. L. Voelkers, New State Ice Co., Box 1107, Oklahoma City, Okla. Phone Ce 2-5111.

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FOR SALE—9x9 slow speed York, 9x9 direct connected to synchronous motor, 6x6 high speed, 12x12 direct connected to synchronous motor, 7½x7½ York, small size units; ice cans; brine coolers; condensers, agitators, electric cranes, blowers, complete plants. Parke Pettegrew & Son Co., 370 W. Broad St., Columbus 8, Ohio.

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1—90 ton Your Evaporative Condenser
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1—100 ton Ice Plant, Diesel Driven
1—120 ton Ice Plant, Electric Driven
5,000 11" x 22" x 47" 300 lb. Ice Cans, Excellent Condition.
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2 10" x 10" York Ammonia Compressors, Medium and High Speed.
3 12½" x 14½" York Ammonia Compressors

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3" x 3" to 12½" x 14½".
Shell and Tube Ammonia Condensers, Brine Coolers, Receivers, Traps, Valves and Fittings.
1 Miller Perfection Ice Scoring Machine.
Write, wire or cable us on any equipment you need.

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make your ice with THREE WAYS BETTER templets

the original green ice-tempering tablets

1 CLEARER ICE—TEMPLETS completely or partially eliminate the cloudy veil, white butts and heavy cores which take away from the "sales appeal" of your ice.

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USED FOR YEARS in ice plants all over the world, TEMPLETS are the famous green tablets that dissolve quickly and leave no odor, taste or color. The TEMPLETS treatment costs only about 1c a ton—try it today at our expense!

make this test in your own plant— FREE

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2. Dissolve two or three TEMPLETS in each can of raw water in alternate rows of cans.
3. Carefully check the quality of the ice made WITH TEMPLETS against that made WITHOUT them. Test the STRENGTH of the ice made with TEMPLETS. Notice its clearness. You'll find that the ice made in the cans with TEMPLETS is clearer, stronger, better ice than that made in the cans where no TEMPLETS were used.

USE THIS COUPON

TO GET YOUR FREE SAMPLE

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Please send me a free sample and literature on TEMPLETS.

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ADVERTISERS INDEX

Refer to Page 65 for Index Classified by Products

American Bitumuls & Asphalt Co. 59
Armour Ammonia Div., Armour & Co. 13
Armstrong Cork Co. ..... Inside Back Cover

Barada and Page, Inc. 72
Bateman Foundry and Machine Co., Inc. 59
Bower Chemical Mfg. Co., Henry 66
Butcher Boy Refrigerator Door Co. 1

Caterpillar Tractor Co. 14
Chicago Nipple Mfg. Co 65
Classified Advertising 71
Classified Trade Index ..... 65, 66, 67, 68 and 69

Dersch, Gesswein & Neuert, Inc. 68
Detroit Ice Machine Co. 70
Dow Chemical Co., The 16
Du pont de Nemours & Co., Inc., E. I., Polychemicals Dept. ..... 2nd Cover

Enterprise Equipment Corp. 71

Greene, Van, R. H. 70

Henry Valve Co. 11

Ice Plant Equipment Co., Inc. 71
Index Coupon & Supply Co. 70
International Salt Co., Inc. 70

Jamison Cold Storage Door Co. ..... Back Cover

King Zeero Co., The 61
Knickerbocker Stamping Co. 63

Lilly Co., The 62
Link-Belt Co. 63

Micron, Inc. 70

National Pipe Bending Co. 67
Niagara Blower Co. 12
Nickerson & Collins Co. 71
Nitrogen Div., Allied Chemical & Dye Corp. 4

Ohio Galvanizing & Mfg. Co., The 61
Ophuls & Associates, Fred 70

Pacific Lumber Co., The 6
Perfection Ice Scoring Machine Co., The 10
Permamix Corp. 65
Philadelphia Pipe Bending Co. 68

Refrigeration Engineering Co. 69
Rempe Co. 66
Reynolds Manufacturing Co. 12
Roots-Connersville Blower Corp. 71
Rubatex Div., Great American Industries, Inc. 8

S & S Vending Machine Co. 61
Shank Co., Cyrus 67
Solvay Process Div., The Allied Chemical & Dye Corp. 57
Sporlan Valve Co. 7
Sun Oil Co. 2

Taylor Instrument Companies 4

Union Bag & Paper Corporation 9

Vivian Mfg. Co. 69
Vogt Machine Co., Inc., Henry 5
Voss Co. Inc., J. H. H. 64

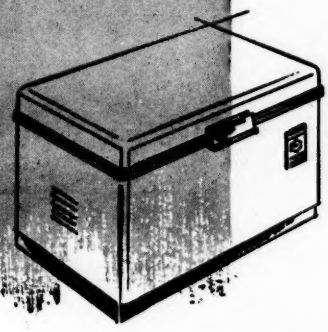
Wanted and For Sale Advertising 71

York Corp. 57

MODEL A

over-all efficiency loss after life test.

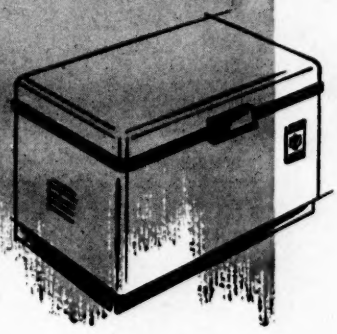
2.35%



MODEL B

over-all efficiency loss after life test.

11.77%



Data like this can help you build better equipment

When these two home freezers arrived at Armstrong for a Life Test, they looked exactly alike. But after several months of testing that amounted to about five years actual service, look at the difference in performance.

Model "A" has suffered an over-all efficiency loss of only 2.35%, while Model "B" lost 11.77%, an excessive drop.

Both freezers were experimental models, incorporating design changes being considered for future production. Like many other manufacturers have done, this company wanted to know what effect on performance the proposed changes would have. That's why they called on Armstrong to help them evaluate the efficiency of the test models. When the Life Test showed such a great difference, it was obvious that there was a defect somewhere in the construction of Model "B." Dismantling the units after the test revealed the cause, and the manufacturer was given all the details in a confidential report.

Simple construction or design oversights can cause you real trouble once your units enter service. Those troubles can be avoided if you send your pilot models to Armstrong for a life test. Here, thorough testing will bring hidden defects to light, giving you a chance to correct them before beginning full-scale production.

Armstrong will be glad to run a complete series of life tests on the units you submit. There is no charge. The only requirement is that one of the models you submit be insulated with one of Armstrong's equipment insulations – LK Corkboard, Fiberglas*, or Temlok®. For further information on Armstrong's Life Test Service, write Armstrong Cork Company, 3008 Skye Drive, Lancaster, Pennsylvania.

* ® OCFCorp.

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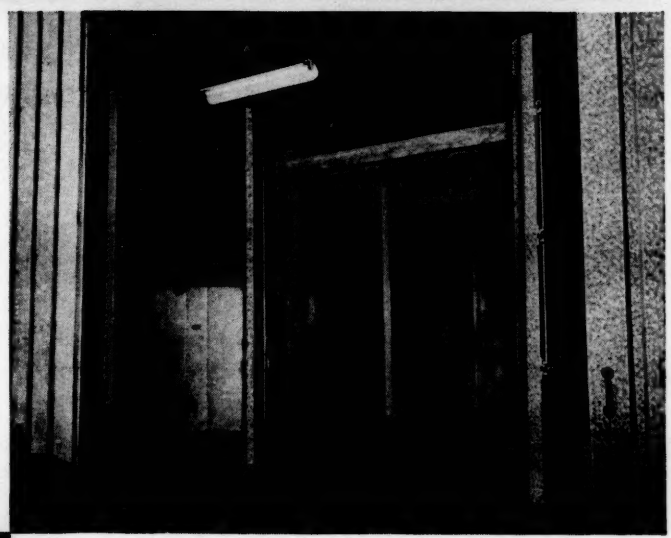
LK CORKBOARD • FIBERGLAS* • TEMLOK

What happens behind Jamison Super Freezer Doors
at Perfection Stove Company's Arctic Laboratory



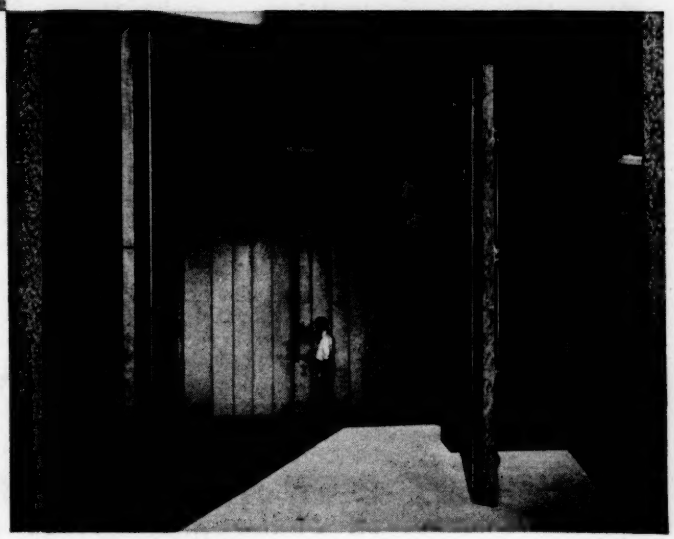
TWO SETS OF DOUBLE DOORS open wide to permit entry for test of combat vehicles and other equipment at new low temperature laboratory of Perfection Stove Co., Cleveland, Ohio. Vehicle entrance doors are 12' x 12' with 8" rock cork insulation. Personnel enter through the more usual 4' x 6'6" Super Freezer doors.

TESTING DONE AT TEMPERATURES DOWN TO —90°F provides data on what happens to men, material, metals and particularly engine heating equipment built by Perfection.

JAMISON

HAGERSTOWN, MARYLAND, U. S. A.

THE LEADER FOR OVER FIFTY YEARS



EASY TO OPEN—A TIGHT SEAL WHEN CLOSED. Almost a ton of door swings freely on each set of Jamison Adjustable Spring Super Freezer Door Hinges. A tight seal is maintained by the Jamison Super Freezer Door Fastener and the special Zero seal gasketing.

For information on all types of Jamison Cold Storage Doors, request Catalog, Sec. 1. Jamison Cold Storage Door Company, Hagerstown, Md., U.S.A.